A DISSERTATION ON

COMPARATIVE STUDY OF SURGICAL THERAPY VS OTHER MODALITIES OF THERAPY FOR PSEUDOCYST OF PANCREAS

Dissertation submitted to

THE TAMILNADU DR.M.G.R MEDICAL UNIVERSITY

CHENNAI

In partial fulfillment of the requirement for the degree of

M.S. DEGREE IN GENERAL SURGERY

BRANCH – I

MADRAS MEDICAL COLLEGE

RAGIV GANDHI GOVERNMENT GENERAL HOSPITAL

CHENNAI – 600 003.

CERTIFICATE

This is to certify that the dissertation titled

"COMPARATIVE STUDY OF SURGICAL THERAPY VS OTHER MODALITIES OF THERAPY FOR PSEUDOCYST OF PANCREAS"

is the original work done by **Dr.A.Gowthaman**, post graduate in M.S., General surgery at the department of general surgery, madras medical college, Chennai 600003 to be submitted to the Tamilnadu Dr.M.G.R Medical university, Chennai 600 032, towards the partial fulfillment of the requirement for the award of M.S.,degree in General Surgery during the academic period from May 2010 – April 2013.

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I solemnly declare that the dissertation titled

"COMPARATIVE STUDY OF SURGICAL THERAPY VS OTHER MODALITIES OF THERAPY FOR PSEUDOCYST OF PANCREAS -A PROSPECTIVE STUDY " was done by me at Rajiv Gandhi Government General Hospital, Chennai-600003 during the period of July 2012 to December 2012 under the guidance and supervisionof Prof K.Ramasubramanian M.S.,

The dissertation is submitted to the Tamil Nadu Dr.M.G.R Medical University, Chennai towards the partial fulfillment of the requirement for the award of **MS Degree in General Surgery Branch –I**

Dr.A.Gowthaman

Place :

Date :

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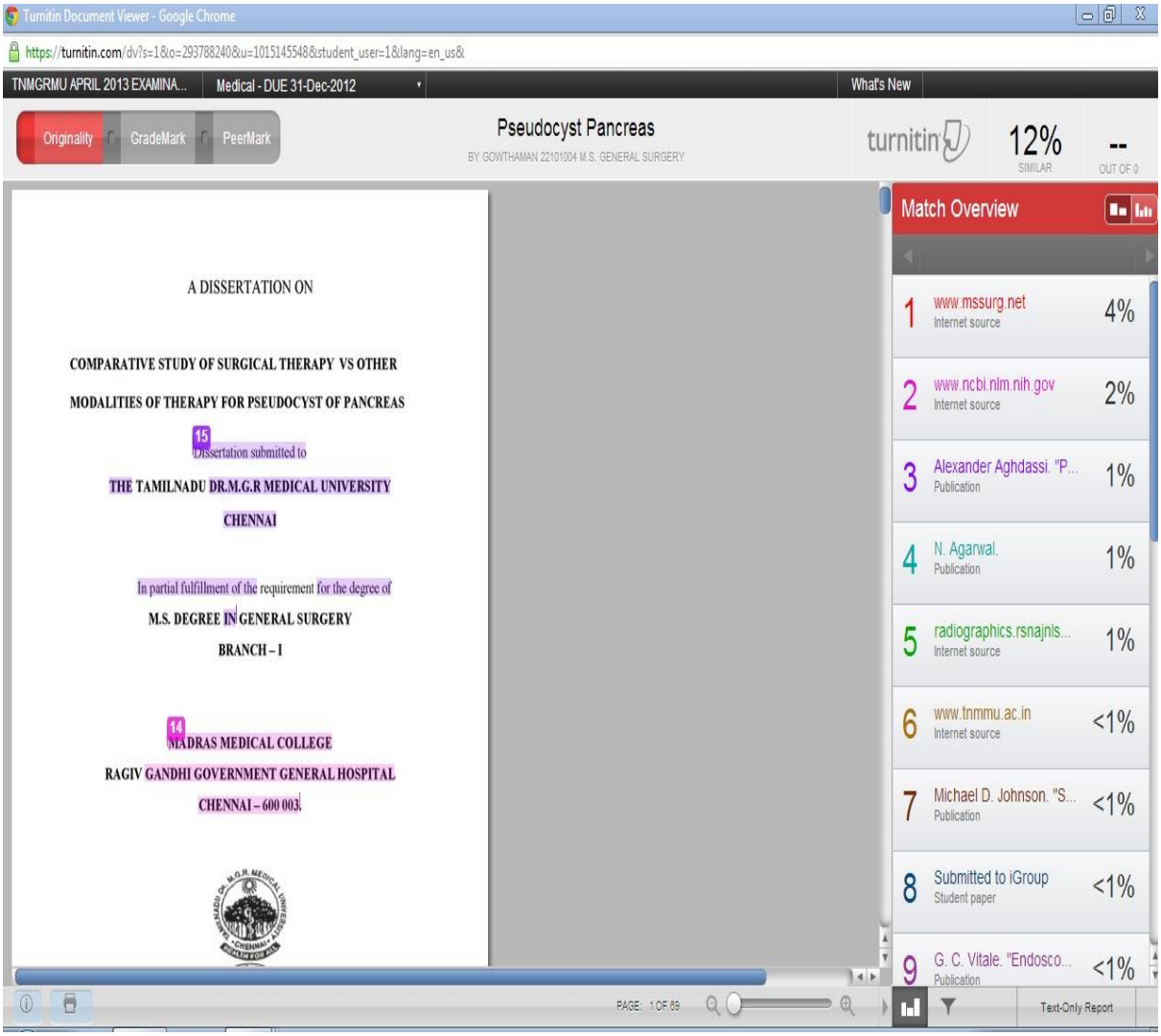
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COMPARATIVE STUDY OF SURGICAL THERAPY VS OTHER MODALITIES OF THERAPY FOR PSEUDOCYST OF PANCREAS

A PROSPECTIVE STUDY

CONTENTS

INTRODUCTION:

Pancreatic pseudocysts are encapsulated collections of necrotic tissue, old blood and secretions walled off by granulation tissue from the pancreas. The prefix “pseudo” is used to emphasize the fact that these collections frequently have no true capsule and that the cyst wall is made up of adjacent viscera such as the stomach and / or colon.

The pseudocysts are the most common complications following pancreatic inflammation both acute and chronic. They also constitute the most frequently encountered cystic lesions of the pancreas others being the cystic neoplasms. For the pseudocysts<5cms there are chances of autoregression.

The pseudocysts present clinically as epigastric pain, abdominal masses to jaundice. The laboratory findings are not much of use in the diagnosis of these pseudocysts. It is radiology which helps in the diagnosis of the pseudocysts with the help of USG, CT scan, MRI, etc. These investigations govern the therapeutic procedures to be carried out. Essentially the treatment for pseudocyst is multimodal one. The treatment team for pseudocysts includes radiologists, endotherapists and surgeons. The radiologists by way of guided per-cutaneous techniques for

aspiration/drainage to the therapeutic embolization of bleeding aneurysms and the endotherapists by way of various endoscopic drainage procedures contribute to the team. The various diagnostic and therapeutic procedures available for intervention are also studied and effectiveness of USG guided aspiration as the primary modality of treatment as compared to conventional surgeries is also studied.

Aims and Objectives

1. To compare USG guided per-cutaneous aspiration with the surgical treatment options available for pseudocyst of pancreas in terms of patient and physician factors.

2. To compare the various surgical drainage procedures that has been employed for the treatment of pseudocysts of pancreas.

3. To compare the results of endoscopic drainage vs surgical procedures employed for drainage of pancreatic pseudocysts.

REVIEW OF LITERATURE

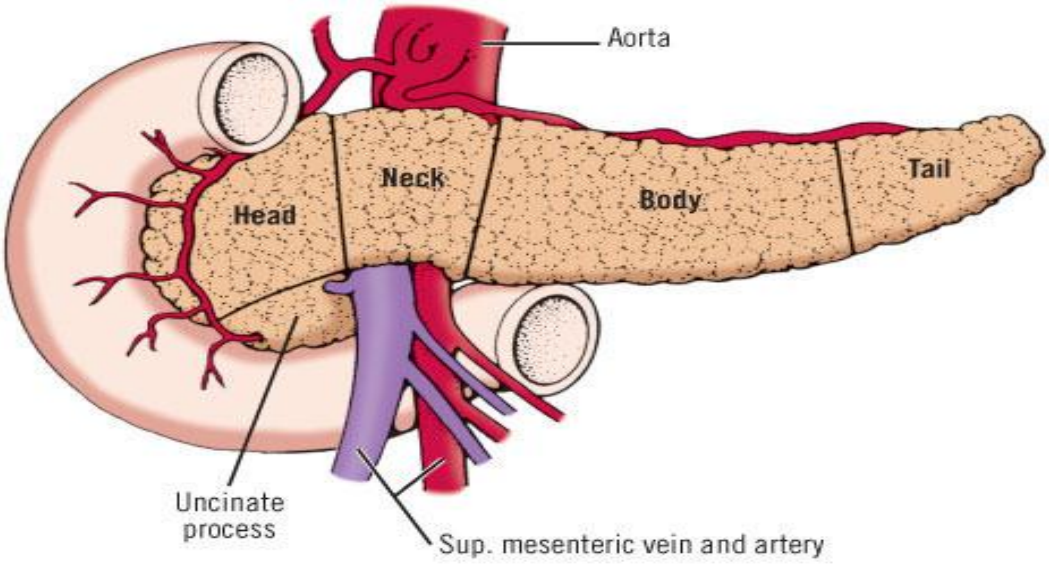
EMBRYOLOGY OF PANCREAS:

Two pancreatic primordial – ventral and dorsal forms the pancreas. Dorsal primordium develops on 26th day and ventral primordium develops on 32nd day both fuse on 37th day. Ventral pancreas forms duct of wirsung,part of uncinate process and head of pancreas. Dorsal pancreas forms remainder of the uncinate process and head ,also body and tail of pancreas.

SURGICAL ANATOMY :

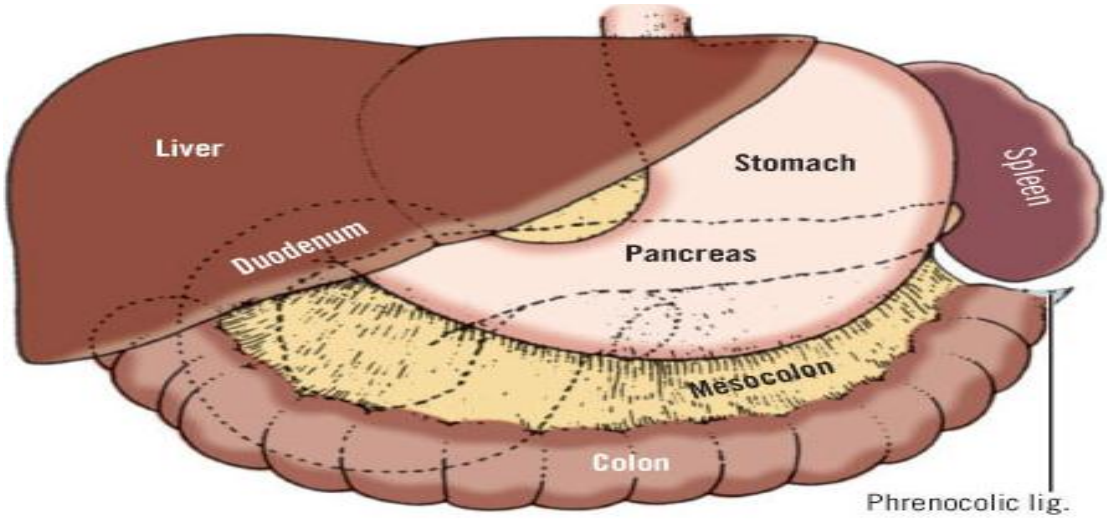
The precise anatomy of the pancreas, its ducts, and its adjacent blood vessels achieves great importance in operating on the pancreas. Failure to be wary of the implications of surgical procedures on the pancreas is often followed by a string of complications that are serious at best and are not unlikely to be fatal. In this regard, the pancreas is one of the most treacherous organs to operate on.

PARTS OF PANCREAS:

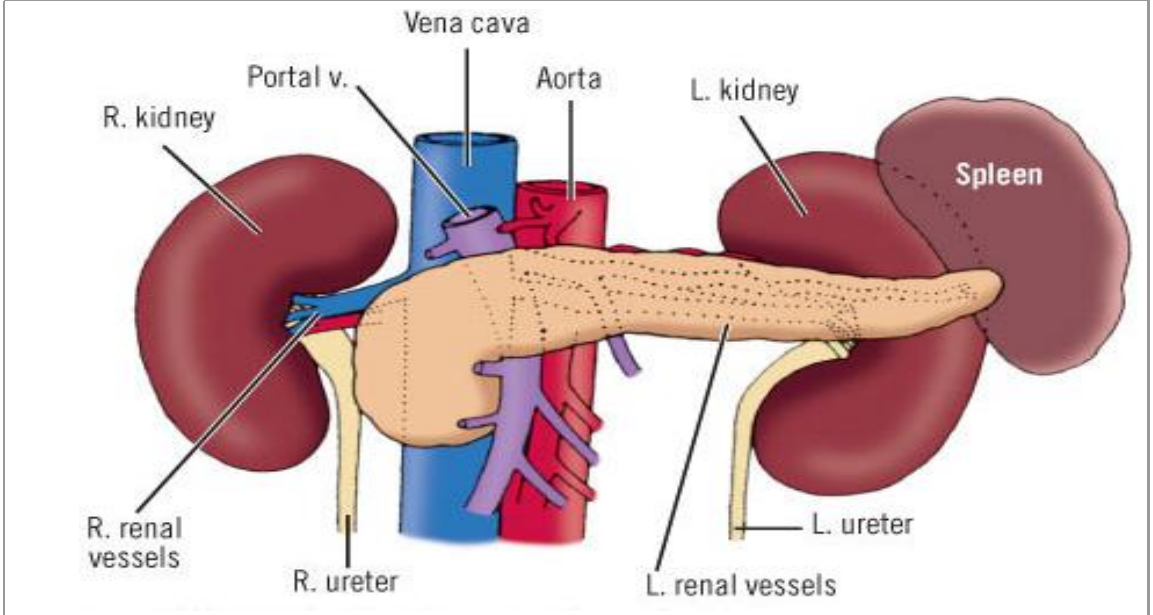


Five parts of pancreas. Line dividing body and tail is entirely arbitrary.

ANTERIOR RELATIONS OF PANCREAS:



POSTERIOR RELATIONS OF PANCREAS:



Ductal System of the Pancreas

20 to 200 acinar cells present within each pancreatic lobule drain into small intercalated ducts these merge to form intralobular ducts which further merge to form secondary pancreatic ducts that drain into the main pancreatic duct (MPD or duct of Wirsung)

MPD gradually increases in caliber from approximately 1 to 2 mm in the tail, 2 to 3 mm in the body, and 3 to 4 mm in the head. The uncinate process has its own pancreatic duct, usually drains into the MPD as it becomes more horizontal, just before the major duodenal papilla.

The accessory pancreatic duct (of Santorini) is the proximal portion of the duct draining the dorsal pancreas. With fusion of the ducts from the dorsal and ventral pancreas, the accessory duct assumes a secondary role and tends only to drain the anterosuperior portion of the pancreatic head. However, sometimes when the ducts do not fuse (≈ 10%), called pancreas divisum, the accessory duct drains the entire dorsal pancreas and none of the uncinate process. The minor duodenal papilla, located approximately 1 to 2 cm proximal and anterior to the major duodenal papilla.

The major duodenal papilla is located on the posteromedial wall of the duodenum, in the second part, 7 to 10 cm distal to the pylorus.

The anatomy of the sphincter complex at the major duodenal papilla, (Boyden and Oddi,) is also variable. There are several sphincters of smooth muscle within the complex.

The length of the sphincter complex may vary from 6 to 30 mm, which probably explains why it is sometimes difficult to achieve a complete endoscopic sphincterotomy. The sphincter complex comprises four elements: a superior biliary sphincter, an inferior biliary sphincter (submucosal), a common ampullary sphincter, and a pancreatic sphincter

Nerve Supply of the Pancreas

Innervation of the pancreas occurs by the

1.splanchnic nerves (sympathetic) and

2. the vagus nerve (parasympathetic).

Both contain efferent vasomotor supply to the pancreatic acini, ducts, and blood vessels – controls exocrine and endocrine functions

Afferent pain fibers is important as pain is a feature of both benign and malignant pancreatic diseases.

Factors governing pain include perineural infiltration by cancer, damage to perineurium, inflammatory mediators, ductal hypertension, and compartment syndrome. Pancreatic pain is poorly localized.

Pain is most often referred to the epigastrium and to the midback. The interruption of pain is an important therapeutic goal - includes various modalities surgical, thoracoscopic, radiologic, and endoscopic chemical approaches. The mainstay of analgesia remains pharmacology.

The preganglionic sympathetic nerves are from the greater (T5-T10), the lesser (T9-T11), and sometimes the least splanchnic nerves. Postganglionic nerve fibers reach the pancreas by accompanying branches of these arteries as periarterial plexi.

The preganglionic parasympathetic nerves, from the celiac division of the posterior vagal trunk, synapse with ganglia within the pancreas. The postganglionic fibers terminate at the pancreatic islet cells. Innervation of the islets cells is almost exclusively from the parasympathetic side, and fibers frequently synapse with acinar cells

before reaching the islet cells, suggesting neural coordination between exocrine and endocrine components.

Arising in the pancreas, the afferent (visceral) pain fibers pass cranially through the celiac plexus to their cell bodies in the dorsal root ganglia within the splanchnic nerves, crossing to the spinal nerves by way of the white communicating rami and at a spinal level comparable to the preganglionic sympathetic fibers.

Physiology of Exocrine Pancreas

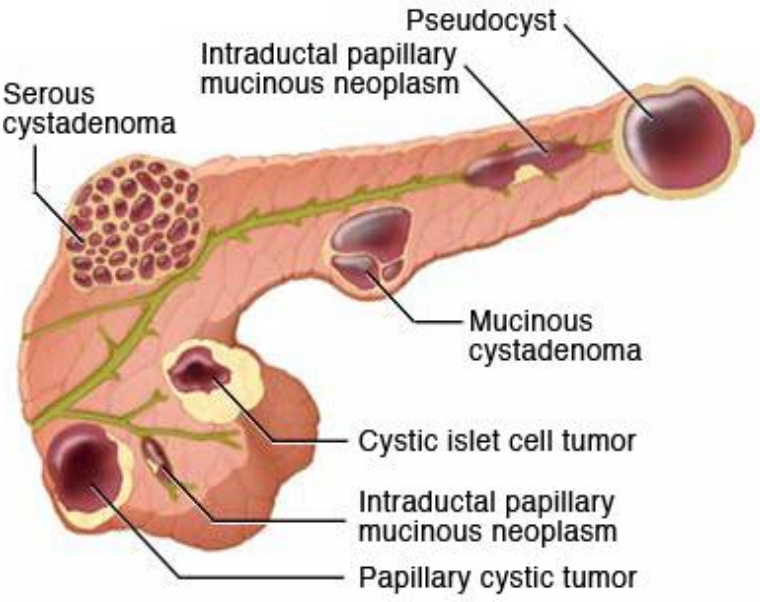
The functional unit of the exocrine pancreas is the acini , the collection of acinar cells responsible for the secretion of digestive enzymes, pancreatic fluid, and electrolytes via the ductal network.

Digestive enzymes are synthesized in the acini& stored in zymogen granules, released at the cell apex by exocytosis into the ducts. Significant defenses exist to prevent premature intra-acinar enzyme activation (a key feature of acute pancreatitis). These include compartmentalization in the granules, separation from lysozymes, trypsin inhibitors, and antiproteases. Enteropeptidase in the intestinal wall activates trypsinogen to trypsin which in turn activates a cascade of the other digestive enzymes.

The exocrine pancreas secretes 800 mL/day or more of alkaline fluid, with a high HCO_3^- content .

Exocrine function of the pancreas is controlled via the hormones gastrin, cholecystokinin (CCK), and secretin. Secretin stimulates cells to produce alkaline pancreatic juice that has low levels of digestive enzymes. CCK causes degranulation of zymogen granules and production of secretion rich in enzymes but low in volume. Stimulation of the vagi releases secretion of a small amount of pancreatic juice rich in enzymes.

Pseudocyst Of Pancreas



Introduction

Pseudocysts are the most common cystic lesions of the pancreas.Other cystic lesions including cystic neoplasms represent only 15% of pancreatic cysts .

Wider use of ultrasound &CT in asymptomatic and mildly symptomatic patients has increased detection of incidental cystic lesions of the pancreas so that the differential diagnosis of pancreatic cystic lesions has become more challenging. Increase in knowledgeabout intraductal papillary mucinous tumor (IPMT) has resulted in better diagnosis & differentiation Differentiating pancreatic pseudocysts from nonpseudocysts is important for determining treatment.

Factors for Non-Spontaneous Resolution of cystic lesions:

- Multiple cysts
- Location in the tail of the pancreas
- Thickness of pseudocyst wall > 6mm
- A communication with the pancreatic duct with an associated proximal stricture of the pancreatic duct
- Increase in size on follow-up examination
- Biliary or postoperative etiology of pancreatitis
- Extrapancreatic development in chronic alcoholic pancreatitis
- Severe acute pancreatitis with pancreatic necrosis
- Size of pseudo cyst> 6cm

Differences between Acute and Chronic pseudocysts

	Acute pseudocysts	Chronic pseudocysts
First noticed	Acute (after a bout of acute pancreatitis)	During investigation of long-standing pain
Number of pseudocysts	Usually single	Mostly multiple
Size	May be large,	Seldom small seldom large
Changing size	Changes rather quickly	Changes slowly
Intrapancreatic/ Extrapancreatic	May be any or combined	Always intrapancreatic

Classification

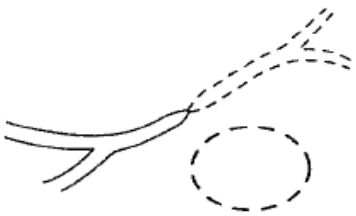
The Atlanta classification system : based on duct anatomy & communication to ducts
a) Acute fluid collection, lack of granulomatous or fibrous Wall
b) Acute pseudocysts, surrounded by fibrous or granulomatous tissue , a consequence of acute pancreatitis or trauma;
c) Chronic pseudocysts, arising in chronic pancreatitis and without a preceding episode of acute pancreatitis
d) Pancreatic abscess, an intra-abdominal collection of pus in the proximity of the pancreas with little or no necrosis

Sarles' Classification : based on association with acute or chronic pancreatitis.
Necrotic pseudocysts -Pseudocysts associated with acute pancreatitis ,arising from pancreatic necrosis and extravasation of pancreatic juice
Retention pseudocysts -Pseudocysts originating from chronic pancreatitis

D'Egidio and Schein Classification system : based on the underlying disease (acute, acute-on-chronic or chronic pancreatitis) & the duct anatomy and the pseudocyst–duct communication.
Type III - "Retention" pseudocysts - occur with chronic pancreatitis & uniformly associated with duct stricture and pseudocyst-duct communication.
Type I - Acute "post-necrotic" pseudocysts - occur after an episode of acute pancreatitis and are associated with normal duct anatomy, and rarely communicate with the pancreatic duct
Type II - Post-necrotic pseudocysts - occur after an episode of acute-on-chronic pancreatitis (pancreatic duct is diseased but not strictured, and there is often a duct-pseudocyst communication)

Classification Based on Duct Anatomy by Nealon and Walser
• Type I: Normal duct/no communication with cyst.
• Type II: Normal duct with duct-cyst communication.
• Type III: Otherwise normal duct with stricture and no duct-cyst communication
• Type IV: Otherwise normal duct with stricture and duct-cyst communication.
• Type V: otherwise normal duct with complete cut-off.
• Type VI: Chronic pancreatitis, no duct-cyst communication.
• Type VII: Chronic pancreatitis with duct-cyst communication.

Type I



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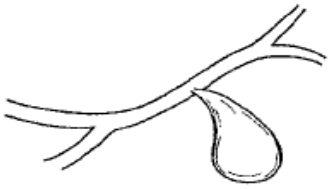

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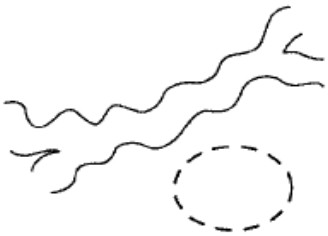

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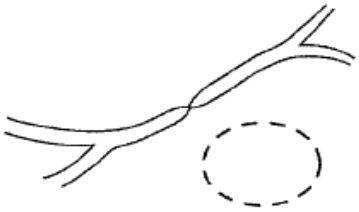
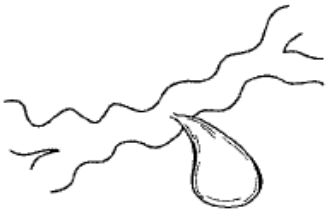
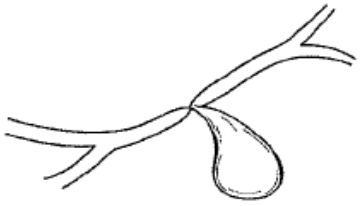


Type III



Type VII



Type IV

Epidemiology

The incidence of pseudocyst

- 5 - 15% in acute pancreatitis
- 20 - 40% in chronic pancreatitis

The most common causes for pancreatitis include alcohol related(56-78%) and gall stone/ biliary diseases.(6-36%). Rarer causes include infective, post-surgical, traumatic & hyperlipidemia or other metabolic causes.

Clinical Presentations::

1. Pain:

Pain in pseudocyst generallly dull aching in epigastrium, may be referred to back. Sometimes pain may be secondary to distension of stomach following obstuction & compression by the cyst directly

2. Bleeding:

Variceal bleed UGI bleed with/without malena secondary to portal gastropathy due to splenic vein involvement(thrombosis/compressionn).

Sometimes bleeding may occur into pseudocyst after major arterial erosion, or if abnormal communication into small bowel.

3. Infection

Infection of pancreatic pseudocysts arises from intestinal flora. May result in sepsis if communication into blood stream occurs. Generally gram negative or anaerobic organisms are the cause(coliforms, enterobacteria)

4. Splenic vein thrombosis

Occursin pseudocysts when located in the body/tail or in relation to chronic pancreatitis.

5. Pancreatic biliary ductal obstruction

Occurs secondary to distal CBD , Pancreatic duct obstruction either due to direct compression over the head of the pancreas or fibrotic changes near the ampulla. Presents as obstructive Jaundice.

Diagnostic Modalities

The most important diagnostic elements for pseudocyst of pancreas include ultasound abdomen, contrast CT abdomen, ERCP & MRCP. Other than this basic laboratory investigations, liver functions parameters, Serum amylase, lipase, tumor markers including CEA, CA 19-9 to rule out cystic neoplasms of pancreasms may be necessary.

Howere the final diagnosis must correlate with the clinical condition of the patient .

Ultasound:

Ultasound abdomen is a simple, cheap and non-invasive modality that must form the first line of investigation for diagnosis of pancreatic pseudocysts.

Pancreas can be visualized in 80% of patients, hence the technique is highly examiner dependent.

Sensitivity of 88–100%

Specificity of 92–98% .

But the negative predictive value (NPV) 9%, so not an ideal tool to exclude small pancreatic pseudocysts. In conjunction with a colour doppler probe(which facilitates better visualisation of blood vessels) it is an ideal tool for interventional treatment.

Endoscopic ultrasound (EUS)

This is a relatively recent diagnostic tool couples high resolution ultrasound probe to the tip of the endoscope. It detects most of the cystic lesions of the pancreas andfor small lesions <2 cm in diameter, Endo Ultrasound has higher diagnostic sensitivity .

Endoscopic ultrasound is superior to CT for smaller lesions (less than 2 cm in size) because of its better spatial resolution.

It detects debris within a pseudocyst with higher sensitivity .

Useful for tissue sampling (EUS guide FNA) to rule cystic malignancies.

Computed Tomography

A contrast Computed Tomography scanning of the abdomen is compulsory for planning the therapy of a pseudocyst.

Overall sensitivity (82–100%)

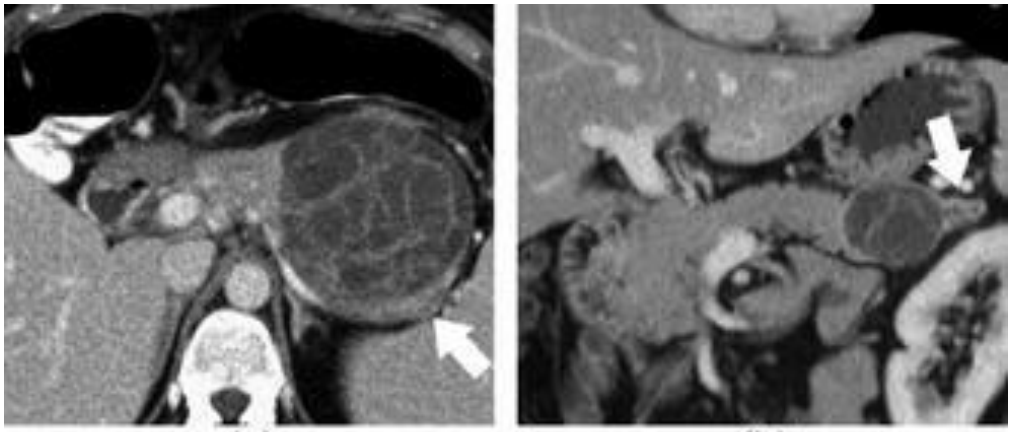
Specificity 98%,

NPV: 92–94%

Overall accuracy of 88–94%.

Pseudocysts mostly appear as round, fluid-filled cavities surrounded by a dense wall.

CECT scan accurately shows the location of the cyst and thickness of cyst wall, internal architecture of pseudocysts, presence of necrotic and devitalised debris and proximity of pseudocysts to major vascular / vital structures.



Endoscopic Retrograde CholangioPancreaticography (ERCP)

ERCPplay s major role in the management of pseudocysts both as a diagnostic and therapeutic tool.

Eventhough it provides less information regarding the size& surrounding structures than CT and USG, it accurately delineates the pancreatio biliary anatomy.

Further, ERCP is essential modality without whose help many classification systems for pseudocysts would be difficult. Eg: Nealon and Walser or D'Egidio and Schein classification systems.

Sensitivity 40-69%(to identify communication of cysts with the duct).

Role of ERCP

- Duct - pseudocyst communication - sensitivity 40-69%
- Common bile duct stricture - Incidence3-23%
- Decides interventions including transpapillary approach for drainage
- Deciding the Surgical management(for decision about the drainage modality).

The complications of ERCP include retrograde introduction of infections, bleeding from major vessels, hollow viscus injury, stent displacement , migration.

Magnetic Resonance CholangioPancreatography

Sensitivity - 70% - 90% (Gold standard -ERCP).

MRCP has much lesser complications than ERCP .

It is less examiner-dependent when compared to abdominal ultrasound.

These features has led to its increased use as a diagnostic modality for chronic pancreatitis,, in spite of its significantly higher cost and its inherent lack of therapeutic options.

MRCP is inferior to ERCP in the diagnosis of cyst–duct communication.

Communications between cyst and duct can be identified by MRCP only if a high intensity fluid tract is present between them.

Further developments in MRI technology will definitely brighten the prospects of MRCP for replacing more invasive diagnostic procedures.

Pathogenesis of Acute Pseudocysts

Acute pancreatic pseudocyst formation is a complex process which starts as an inflammatory process, slowly matures with the collection of pancreatic debris/ products & residues of inflammation with possible rupture of pancreatic duct into more of an organised cyst.. It may either be secondary to duct disruption(secondary to pancreatic necrosis) or mere peripancreatic collectionsfollowing oozing from inflamed pancreatic surface.

Collections of pancreatic juice generally remain as local collections in the region of duct disruptions. If these collections break the thin layer of mesenchymal connective tissue around the pancreas, it reaches the anterior pararenal space or the lesser sac.

The most common site for accumulation of these pancreatic collections is the lesser sac, bounded between stomach, transverse mesocolon. Spleen and duodenum.

At first, these fluid collections are ill defined, extending along the peri-pancreatic and para-renal regions, and henceshould actually be called **acute fluid collections** in this phase. Most of these follow an attack of

acutepancreatitis and will resolve themselves if there is no secondary infection or large quantity of debris.

If these acute fluid collections stays on for> 4-6 weeks without spontaneu=ous resolution they develop thick wall & can be termed as pseudocysts. However with time due to fibrosis the pancreatic duct- cyst fistula may spontaneously close.

Pathogenesis of Chronic Pseudocysts

For the pathogenesis of pseudocyst formation in chronic pancreatitis two mechanisms may be involved.

1.Acute exacerbation of underlying disease process. This is the reason for cysts appearing in acute on chronic pancreatitis.

2.Block / disruption of a major pancreatic duct by a protein ,calculus/ fibrosis may lead to pancreatic cysts or pseudocyst formation . Wheneverther is blockage to distally there is proximal saccular dilatation of the system.

These lead to the formation of Retention cysts(True cysts). Intially multilple microcysts form which may eventually coalesce to form bigger pseudocysts..

Pancreatic duct injury plays a major role in the pathogenesis of chronic pancreatic pseudocysts. The pancratic duct is most prone for damage at its angulation "genu" were it turns acutely.

Anatomical Extensions of Pseudocyst

Pseudocysts are generallly limited to the pancreas and the peri pancreatic spaces. But sometimes they extend into nearby potential spaces and compartments thereby causing significant symptoms according to their

target site.

1.A ductal disruption dorsally into the space between the pancreas and portal vein can lead to pancreatic fluid accumulation in the right chest by travelling up the pancreatic groove of the portal vein into the hepatoduodenal ligament and then through pleuroperitoneal windows

2. In some cases, disruption near the head of the pancreas can produce pancreatic fluid collections in the mesentery or left paranephric space.

3. A disruption dorsally from the pancreatic head might lead to pancreatic fluid accumulation i the left chest as it travels in the retroperitoneum underneath the stomach or spleen and through pleuroperitoneal foramina or in the left paranephric space.

4. A ductal disruption ventrally results in fluid accumulation in the lesser sac or in the peritoneum cavity, i.e. pancreatic ascites.

5. There are also cases with extension of the pancreaticj uice located far from the pancreatic gland, e.g. to the neck.

6. Extension into the transverse mesocolon may occur because of the anatomic relationship of the transverse colon to the pancreas.

7. The cyst may also extend to the anterior or posterior pararenal space, mediastinum, and retroperitoneum.

8. Posterior pseudocysts, also rare, may extend inferiorly into the pelvicregion and groin (even upto the scrotum).

Morphology of Pseudocyst

The Pseudo cyst of pancreas lack a true cyst wall. It is merely the fibrotic condensation of inflammatory material around the cyst. There are no clear

lines of demarcation between the well-developed pseudocyst and the adjacent normal anatomical structures. This fact has to be born in mind both for pathogenesis and treatment.On gross inspection of the pseudocyst wall, generally connection with the pancreatic duct system cannot be identified although, by endoscopic pancreatography, connections can be demonstrated.

The pseudocyst is generally fluctuant because of its cystic contents. The contents may vary widely from a colourless clear to turbid fluid to brownish thick fluid with pancreatic debris to frank purulent material . Rarely, the fluid can also be blood-tinged or frankly hemorrhagic.

Pseudocysts are mostly single, but rarely could be multiple(10%).

Pancreatic pseudocysts are commonly round to oval, but some may be multilocular and irregular in shape. The size of pseudocysts varies from 2 to as large as 35 cm.

Estimated capacity ranges between 10ml and 6L. The serum amylase, lipase, and trypsin contents are generally markedly elevated.

The amylase level may be lower in older pseudocysts, indicating the etiology to be chronic rather than acute pancreatic insult. The

spontaneous disappearance of small cysts may be due to the loss of connection with the pancreatic duct system..

TREATMENT

Previously very limited options were available for the management of pseudocysts. Surgery was the only availabe option. The controversy was primarily regarding the time of intervention.

Early intevention led to unnecessary increase in the rates of external drainage. . With improvements in technology and newer minimally interventional modalities image guided percutaneous drainage, endoscopic and laparoscopic drainage methods have become more popular.

With increase in the choice of options available the decision to choose the apt method has become more complex.

Indications for therapeutic intervention of pancreatic pseudocysts.

Complicated pancreatic pseudocysts (one criterion sufficient)

- Compression of large vessels (clinical symptoms or seen on CT scan)
- Gastric or duodenal outlet obstruction
- Stenosis of the common bile duct due to compression
- Infected pancreatic pseudocysts
- Haemorrhage into pancreatic pseudocyst
- Pancreatico-pleural fistula

Symptomatic pancreatic pseudocyst

- Satiety
- Nausea and vomiting
- Pain
- Upper gastrointestinal bleeding (10–20%)

Asymptomatic pancreatic pseudocyst

- Pseudocysts >5 cm, unchanged in size and morphology for more than 6 weeks
- Diameter >4 cm and extrapancreatic complications in patients with chronic alcoholic pancreatitis
- Suspected malignancy: median 5-year survival rate after resection 56%

a.

The Treatment Approaches for Pancreatic Pseudocyst

- Open surgical
- Cystogastrostomy
- Cystoduodenostomy
- Roux-en-Y cystojejunostomy
- Distal pancreatectomy ± splenectomy
- External drainage
- Laparoscopic
- Cystogastrostomy
- Cystoduodenostomy
- Roux-en-Y cystojejunostomy
- Distal pancreatectomy ± splenectomy
- External drainage
- Radiologic
- Percutaneous drainage
- Percutaneous transgastric drainage
- Endoscopic
- Transpapillary pancreatic duct stent
- Transgastric stent
- Transduodenal stent

Surgery has been the mainstay of treatment for pancreatic pseudocysts for long. Itis being challenged by the newer endoscopic & interventional techniques.

With the introduction of endoscopic ultrasonography, endoscopic drainage has become safer and the risks associated with endoscopic drainage have come down. Complete remission and disappearance of symptoms after surgical and endoscopic methods are near comparable, but decision to choose either method depends on the patient and logistic factors.

PERCUTANEOUS CATHETER DRAINAGE

Pseudocysts can be drained by USG or CT guidance. It could be either temporary by needle aspiration - in which it could be used as a therapeutic modality or for diagnostic purposes(to quantify enzymes, cancer markers). Following drainage a pigtail catheter can be left in side the cyst cavity, so as it can act as a continuous drain. It is left in situ till no further drain is obtained.

INDICATIONS AND CONTRAINDICATIONS

The indications for percutaneous drainage are same as those for surgery.

These include-

- Persistent pain,
- Sepsis ,
- Involvement of nearby organs,
- Increasing size,
- Obstructive jaundice
- GOO

But its use is more important in the management of immature symptomatic fluid collections. It is of particular use in patients at high risk and morbid patients who may not withstand surgery/endoscopy, as a temporary palliation.

Contraindications to catheter drainage of pseudocysts .

- Collections associated with a solid or non-drainable pancreatic mass or with subtotal gland necrosis (more than 50 % parenchymal necrosis)
- Suspicion of malignancy
- Lack of a safe access route
- Recent or active haemorrhage into the collection, the presence of an arterial pseudoaneurysm
- Collections associated with obstruction of the main pancreatic duct (especially complete cut-off)

PERCUTANEOUS DRAINAGE- TIMING

Timing of the procedure is not important for the percutaneous drainage, as it does not require the maturation of the wall as for surgery.. The only criterion required is image proof that the pseudocyst does need drainage.

PERCUTANEOUS ASPIRATION-RESULTS

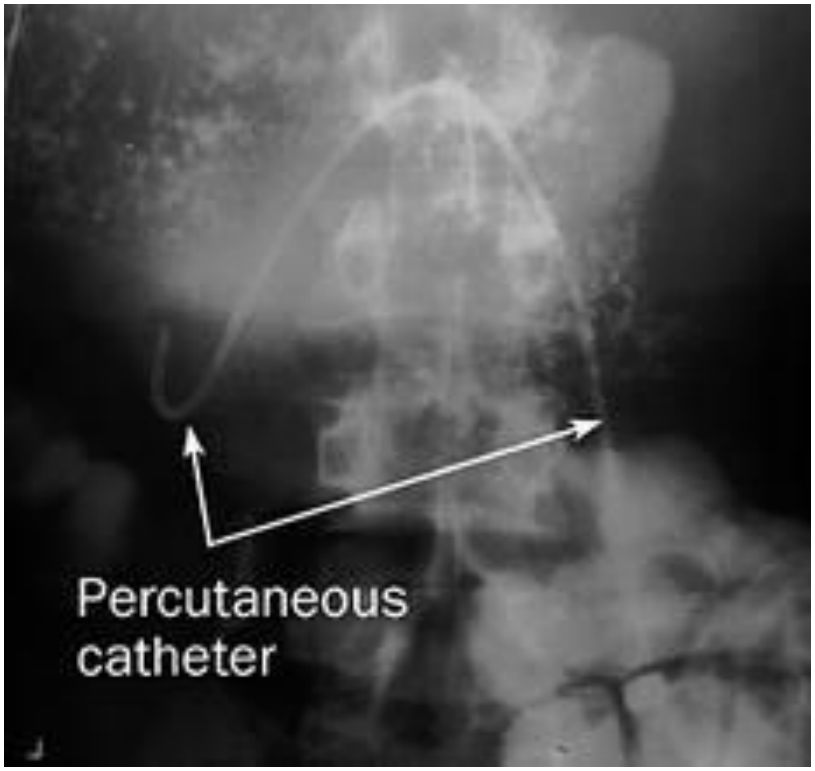
Percutaneous aspiration is safe& ideal for diagnosis but is usually ineffective for therapy with a curatuve intent.

Especially those chronic pseudocysts that have thick walls and are surroundedby fibrosis ,into which needle aspiration may not be effective in collapsing the walls.

The pseudocysts with ductal communication, which may be in 50 percent to 75 percent of cases, generally reaccumulate fluid usually within a day of aspiration.

According to some authors pseudocysts that do not communicate with the pancreatic duct system can be drained with a fine-needle evacuation. It hasmany benefits including instantaneous pain relief and clinicalimprovement, but at the same time the risk of introducing external infections and fistula formation by indwelling catheter is reduced.

But In the case where the pseudocyst content is purulent or when the cyst fluid is thick/difficult to evacuate completely, then an indwelling catheter must be inserted.


Percutaneous
catheter

ENDOSCOPIC DRAINAGE

The therapeutic concept behind endoscopic drainage is that , the pseudocyst does not have its own structure, instead it is a space bounded by other abdominal organs.

This makes the pseudocyst accessible from other accesible organs.

Usually, the pseudocyst is accessed from stomach(transgastric) or through the common papilla(transpapillary).

Endoscopic drainage of pancreatic pseudocyst appears to be a effective, safe and definitive procedure for patients whose anatomic considerations allow its use.

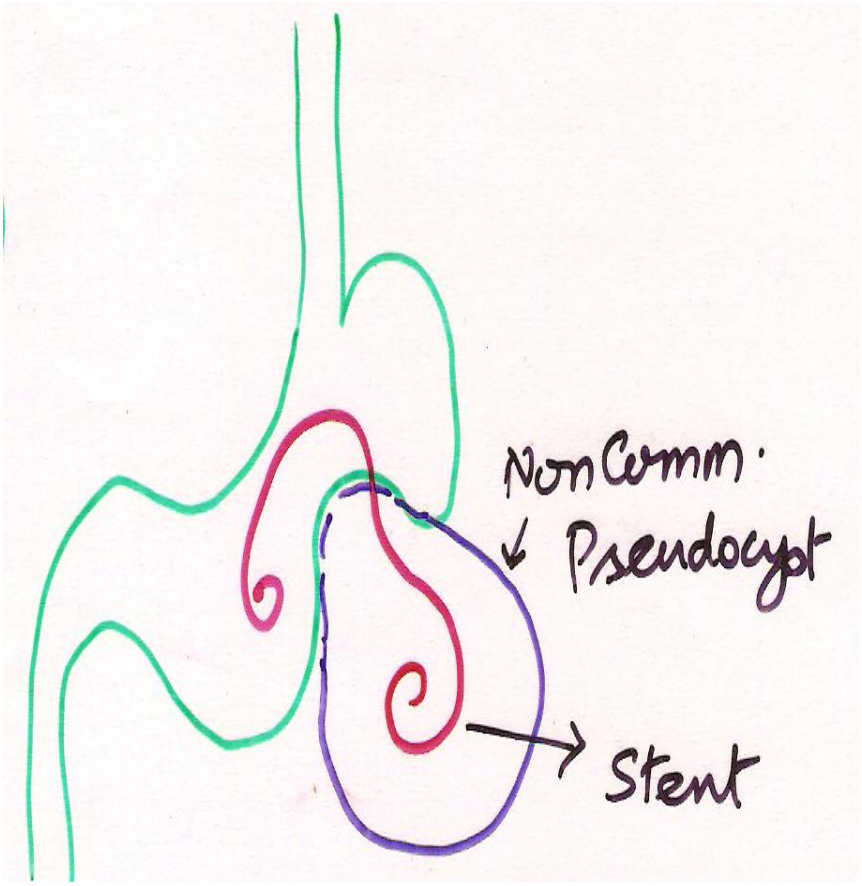
This knowledge should be adequately understood and utilized appropriately by the surgical community .

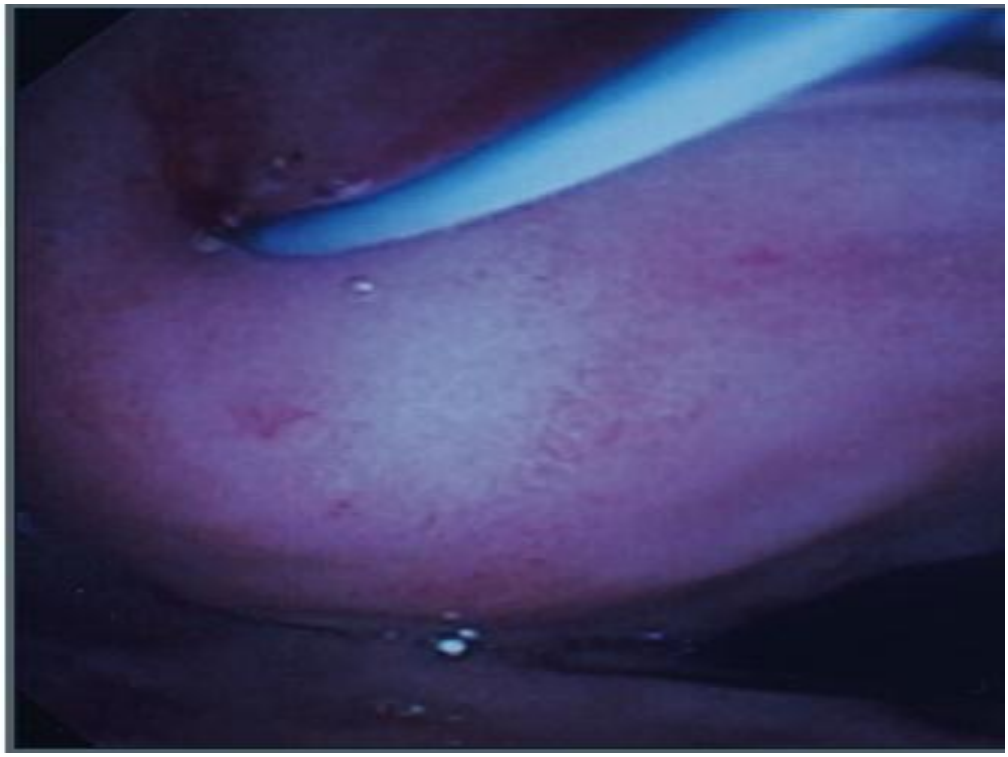
INDICATIONS AND BASIC PRINCIPLES

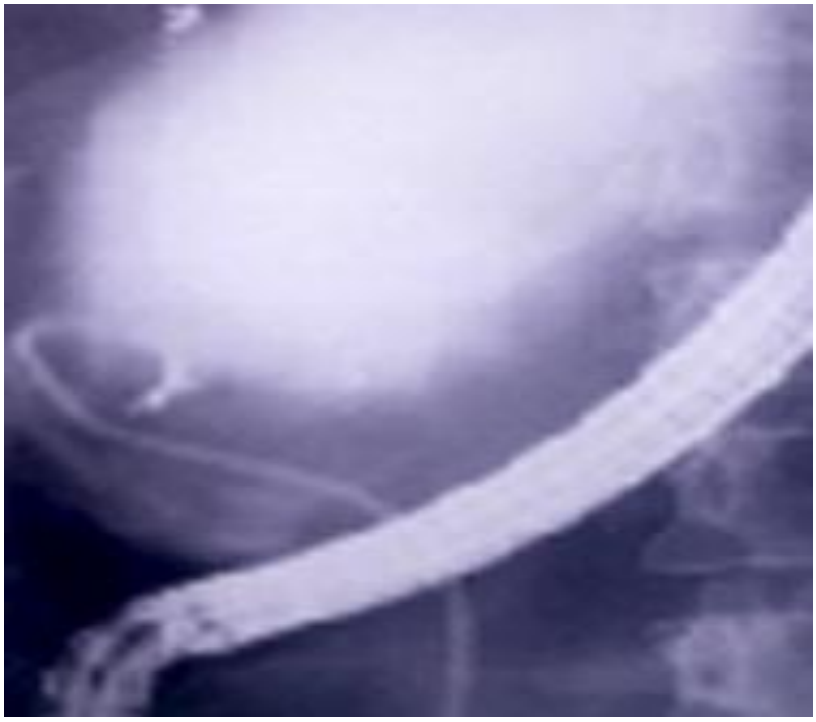
Endoscopic drainage methods are basically extensions of OGD scopy and ERCP techniques and rely on the use of the therapeutic duodenoscope/ERCP accessories.

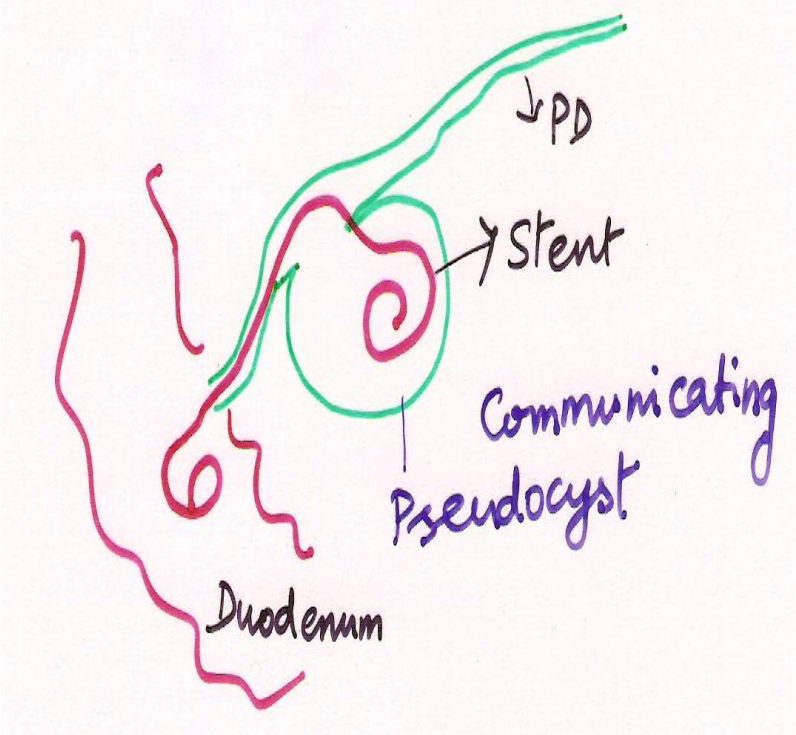
Proposed guidelines for endoscopic pancreatic pseudocyst drainage

1. Allow pseudocyst time to mature
2. Identify and address pseudoaneurysms
3. Evaluate for the presence of portal hypertension and gastric varices
4. Ensure that the pseudocyst is in close apposition to the gastric or duodenal wall
5. Perform pancreatography first Identify debris within pseudocyst
6. Use a transpapillary approach whenever feasible
7. Use aspirating needle catheter to test for blood before puncture
8. Clinical findings should be consistent with a pseudocyst


Non Comm.
Pseudocyst
Stent






PD
Stent
Communicating
Pseudocyst
Duodenum

For acute fluid collections

1.Drainage is indicated if symptomatic or Infected

2.Transpapillary **drainage** via placement of bridging stent across ductal leak done

(Varadarajulu et al-GI Endoscopy 2005;)

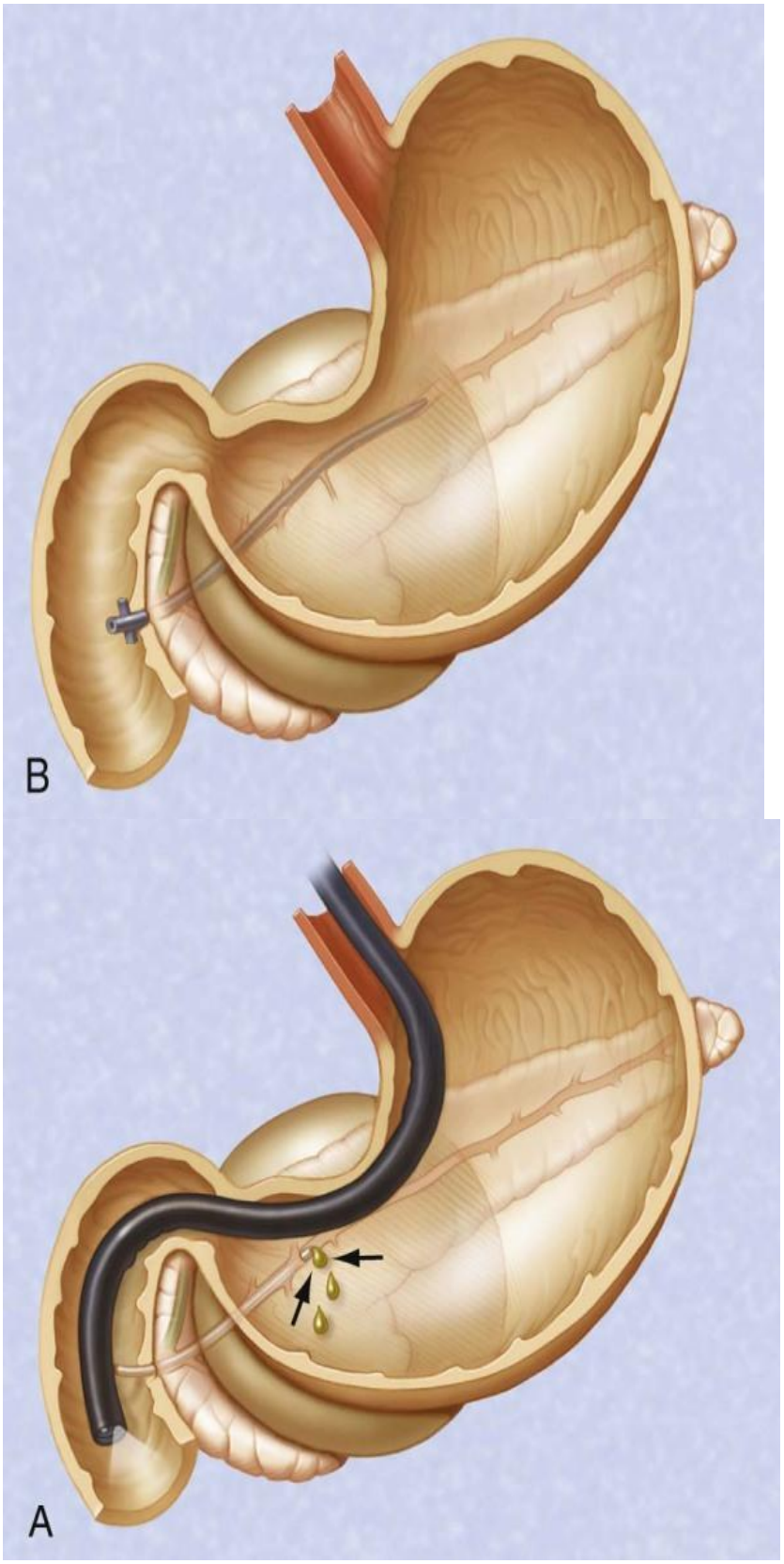
ENDOSCOPIC DRAINAGE OPTIONS

TRANSMURAL DRAINAGE

1 NON EUS GUIDED

2 EUS GUIDED

TRANSPAPILLARY DRAINAGE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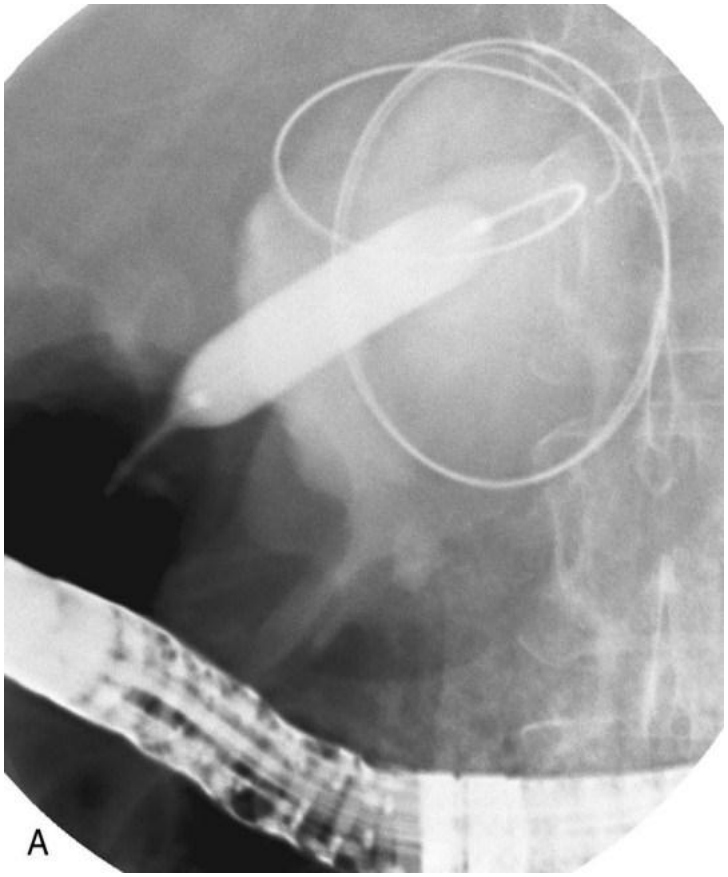
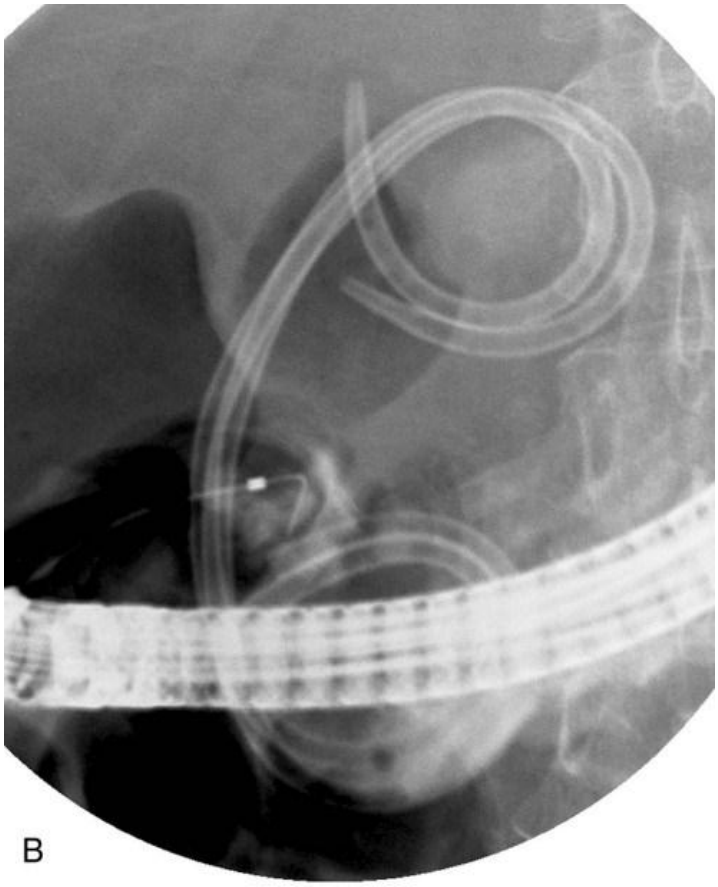
A


A

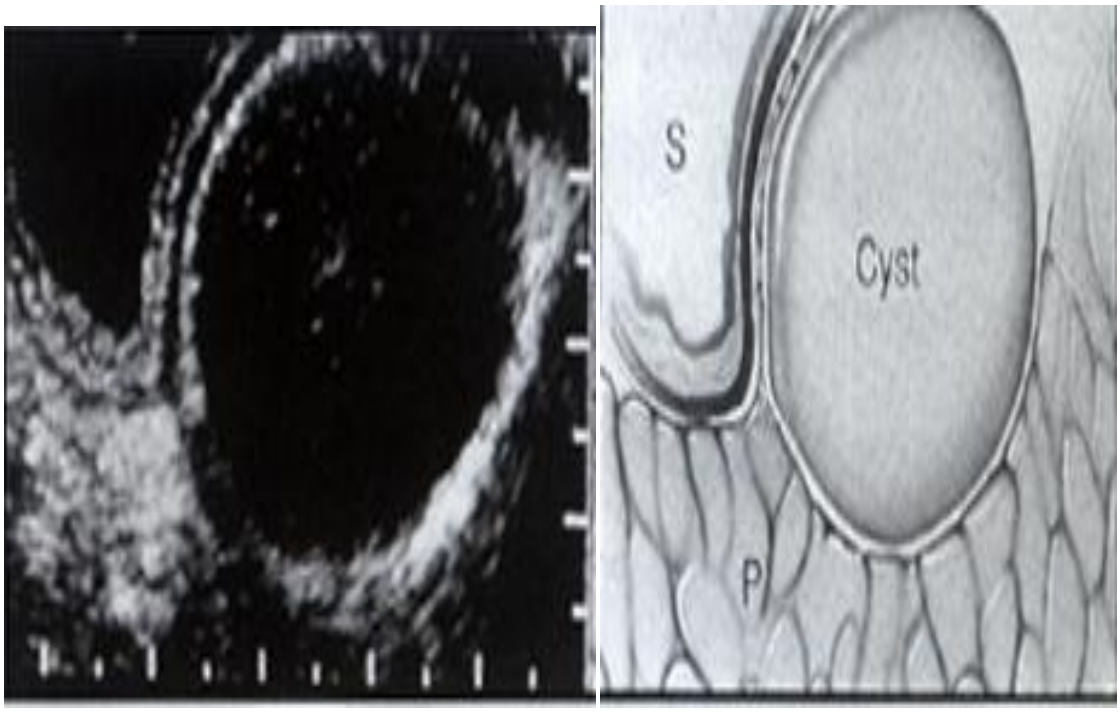

B

ADVANTAGES OF EUS GUIDED DRAINAGE

1 Color Doppler USG helps avoid vessels

2 Cyst can be drained in absence of luminal compression

3 Allows characterization of nature,number,size of fluid collections



TRANSMURAL DRAINAGE

Varadarajulu et al

EUS vs EGD FOR TRANSMURAL DRAINAGE OF PANCREATIC PSEUDO CYSTS

(GI Endoscopy-2008:68:1102)

EUS GUIDED	NON EUS GUIDED
TECHNICAL SUCCESS-100%	TECHNICAL SUCCESS-33%
CLINICAL SUCCESS-100%	CLINICAL SUCCESS-87%

TransPapillary Approach

Preferred when the pseudocyst communicates with PD

Complication rates are found to be lower(16%) compared to transmural(39%)

(De palma et al-Hepatogastroenterology-2002)

Stents may be placed into pseudocyst to effect drainage

(Binmoeller KF Gastrointest Endosc 1995;)

Surgical Approaches

There are various surgical methods available for the drainage of pancreatic pseudocyst.

These include

Cystogastrostomy

Cystoduodenostomy

Roux-en-Y cystojejunostomy

Distal pancreatectomy ± splenectomy

External drainage

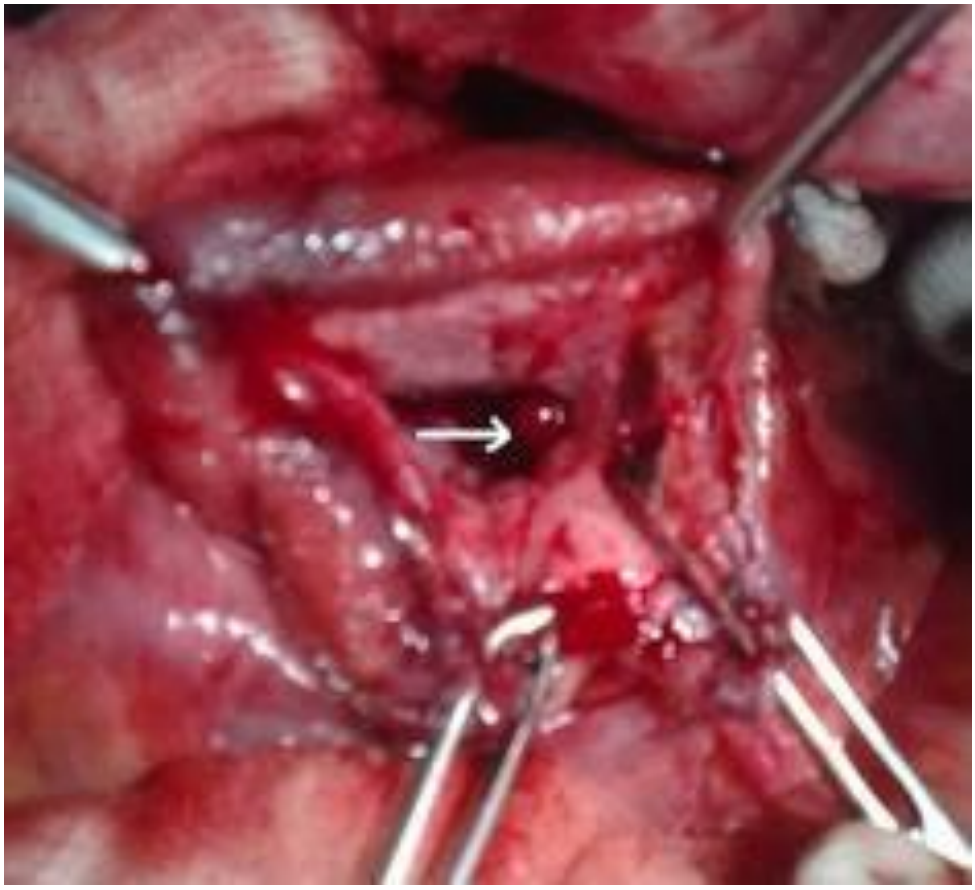
Cystogastrostomy:

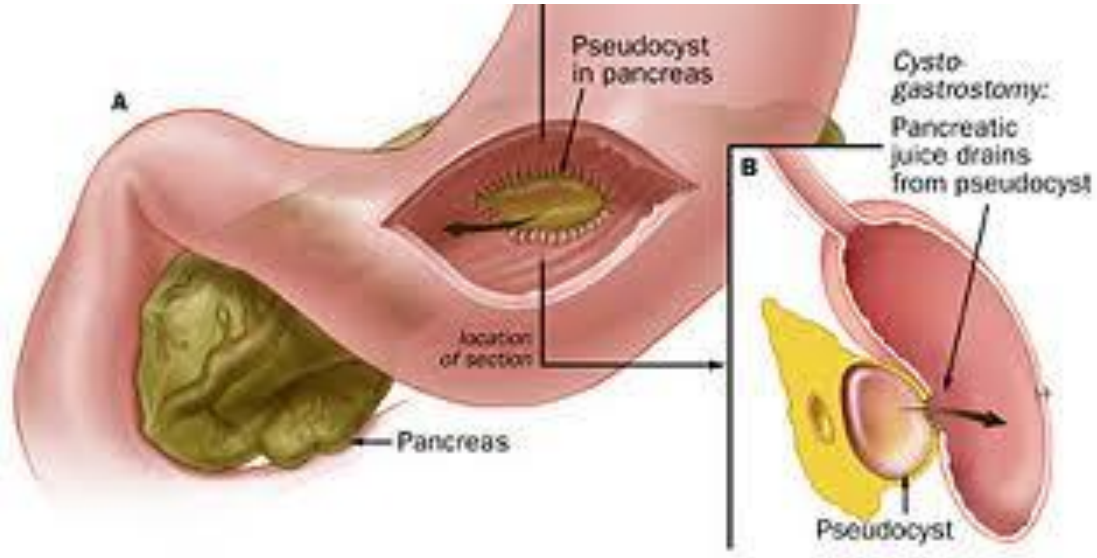
This is the most commonly employed mode of internal drainage for pseudocyst of the pancreas. This is ideal for most of the mature psedocysts which impinge and create an impression on the posterior gastric wall.

This procedure is associated with minimum complications and chance of recurrence. Anterior gastrotomy is made , needle aspiration is done to confirm the location of pseudocyst. Now after taking stay sutures, the

posterior wall of stomach is opened immediately over the pseudocyst, pseudocyst is drained. Then, continuous sutures are placed anastomosing the pseudocyst to posterior gastric wall.

The rare complications may involve abscess formation in the pseudocyst cavity. But generally the cavity collapses as the peristalsis removes the cyst contents by reducing the pressure within.



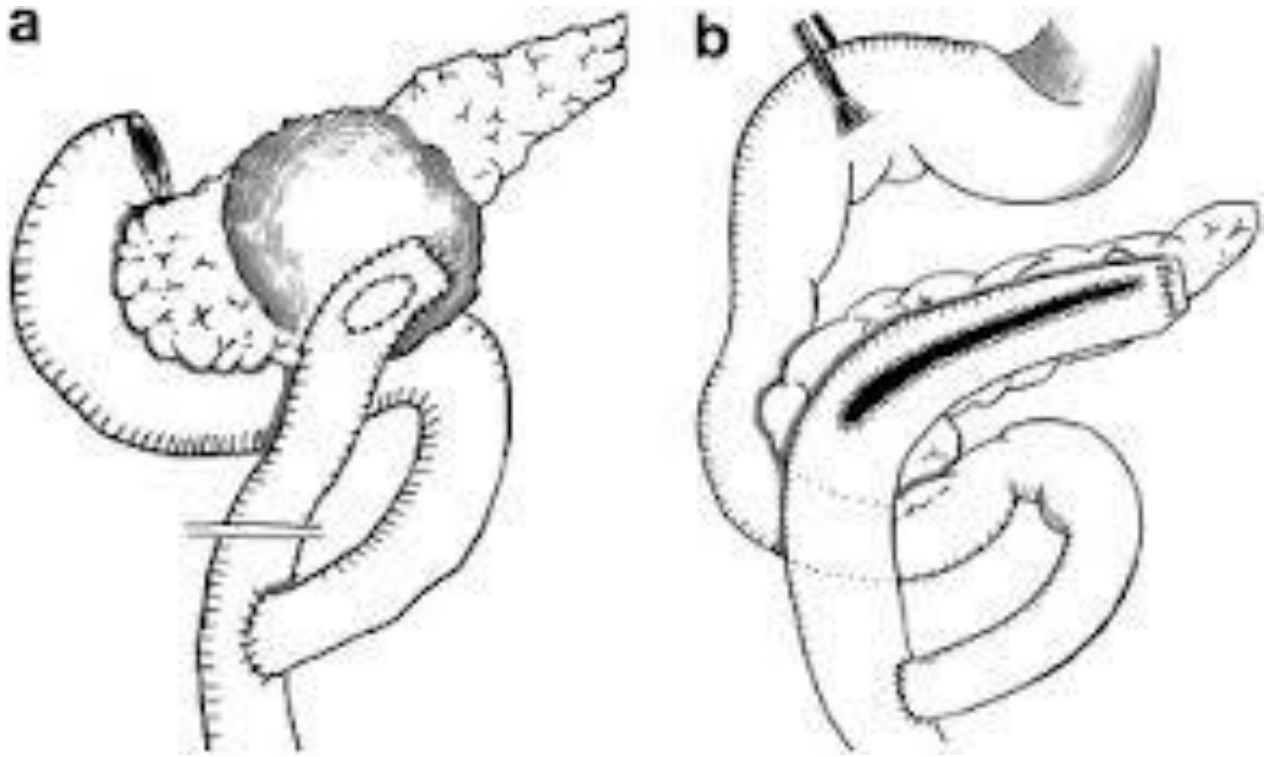


Roux-en-Y cystojejunostomy

This type of procedure is best suited for those cysts which don't have a gastric impression, but mature enough to warrant a drainage procedure.

Jejunum is disconnected and Roux loop is taken up anastomosed with the pseudocyst in two layers.

It may be combined with a lateral pancreatico-jejunostomy particularly in those with a dilated pancreatic system secondary to stricture of main pancreatic duct or obstruction.



Cystoduodenostomy

This is a relatively rarer procedure which is reserved for cases with pseudocyst in the head of the pancreas impinging on the C-loop of the duodenum.

Care must be taken to avoid damage to the ampulla and distal part of CBD and pancreatic ducts.

Distal pancreatectomy ± splenectomy

This type of surgery was done for the pseudocysts in the tail of the pancreas. But with other modalities of intervention & better drainage procedures this therapy has become obsolete.

External drainage

External drainage of a pseudocyst pancreas has limited role but finds use in the critically-ill patient.

A controlled external fistula is an acceptable goal in these circumstances. Other rarer indications for external drainage include the control of an immature ruptured pseudocyst and when there is bleeding into the cavity of the pseudocyst where there has been underrunning of the bleeding point.

A Endoscopic intervention by means of a transpapillary stents following such a surgery usually results in faster resolution of the external fistula.

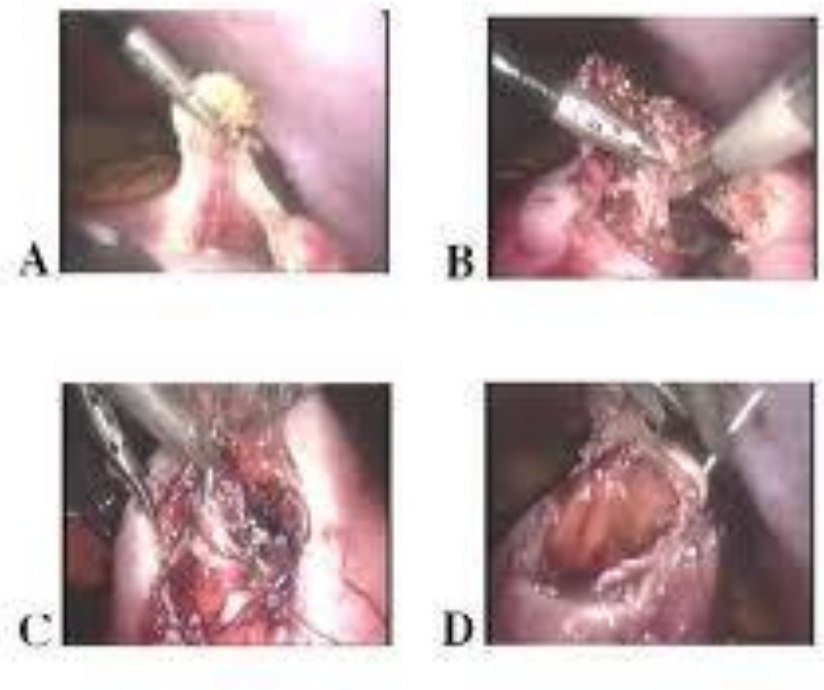
The use of long-acting somatostatin analogue also aids in this cause.

Laparoscopic Procedures:

All the above mentioned procedures can be laparoscopically, it has the advantage of faster recovery and return to normalcy. Care must be taken

while dealing with large cysts not to advertently rupture the cyst while introducing the ports.

The post operative pain is generally much lesser than compared to open methods.



PROFORMA

PRE OP : -

Name : Age : Sex : IP No. :

Duration of symptoms :

Co-morbid illness :

DM : yes / no IHD / CAD : yes / no

HT : yes / no TB : yes / no

On admission :

Pulse : BP :

Anemia : yes / no Icterus : yes / no

Pedal edema : yes / no

CVS: RS:

P/A:

Investigations :

Hemogram:

Renogram:

Liver Function Test:

S.Amylase S.Lipase S.LDH S.CALCIUM

USG ABD:

CECT ABD:

MRCP::

ERCP::

OGD SCOPY:

INTERVENTION DONE: -

SURGICAL:: YES/NO;

IF YES DETAILS:

USG GUIDED INTERVENTIONS: YES/NO:

IF YES DETAILS:

ENDOSCOPIC INTERVENTIONS:: YES/NO

IF YES DETAILS:

POST OP : -

USG ABD TO NOTE FOR RESIDUAL PSEUDOCYST

LFT AND S.AMYLASE/LIPASE

MATERIALS & METHODS

The study is a Prospective Observational study conducted at Rajiv Gandhi Government General Hospital from July 2012 to December 2012.

50 adult patients with symptomatic pancreatic pseudocyst were included in the study .

Pseudocysts with greater than or equal to 6 weeks duration or cyst wall of 6mm thick or more will be involved in the study.

Children and traumatic pseudocysts, and Pseudocysts<6 weeks duration and wall thickness of < 6 mm were excluded from the study.

Patients were subjected to baseline investigation`s (Biochemistry, Haemogram, and Chest Skiagram). This was then followed up by specific investigations like serum amylase, serum lipase, serum LDH, serum Calcium, liver function test.

USG – Abdomen and CT – Abdomen were done to all to identify the morphology , size, extent, shape of the pseudocyst, the relation to the pancreas and its accessibility from Gastrointestinal tract.

MRCP & ERCP was done to identify the pancreatic duct morphology, communication to the pseudocyst cavity, abnormalities and variations in minor and major draining systems, & to detect biliary pathology.

Each patient was then classified according to the type of pseudocyst and the mode of therapeutic intervention was decided .

Indications for drainage

- Presence of symptoms (> 6 wks)
- Enlargement of pseudocyst (> 6 cm)
- Complications
- Thick walled cyst(>6mm)

They were subjected to either

1. USG guided drainage
2. Endoscopic drainage
3. Surgical drainage

OBSERVATIONS & RESULTS

The results of various procedures were compared and contrasted based on immediate relief of symptoms and post interventional complications.

Table 1 : Presumed Causes of Pancreatic Pseudocyst

causes	No. Of cases	Percentage
Alcohol related	40	80%
Biliary	7	14%
Both alcohol & biliary	2	4%
Idiopathic	1	2%
Total	50	100%

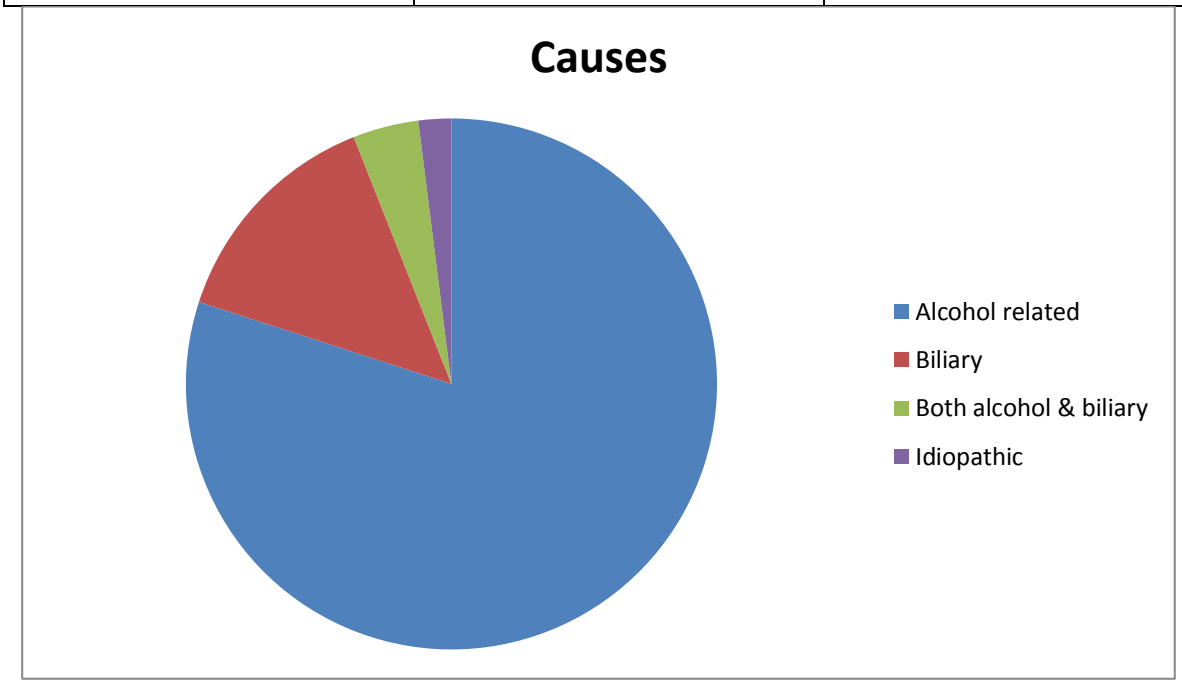


Table 2 : Indications for Intervention:

Indication	No. Of cases	Percentage
Persistent pain	30	60%
Gastric outlet obstruction	7	14%
Obstructive jaundice	4	8%
Infected cyst	3	6%
Rupture	1	2%
Others	5	10%
Total	50	100%

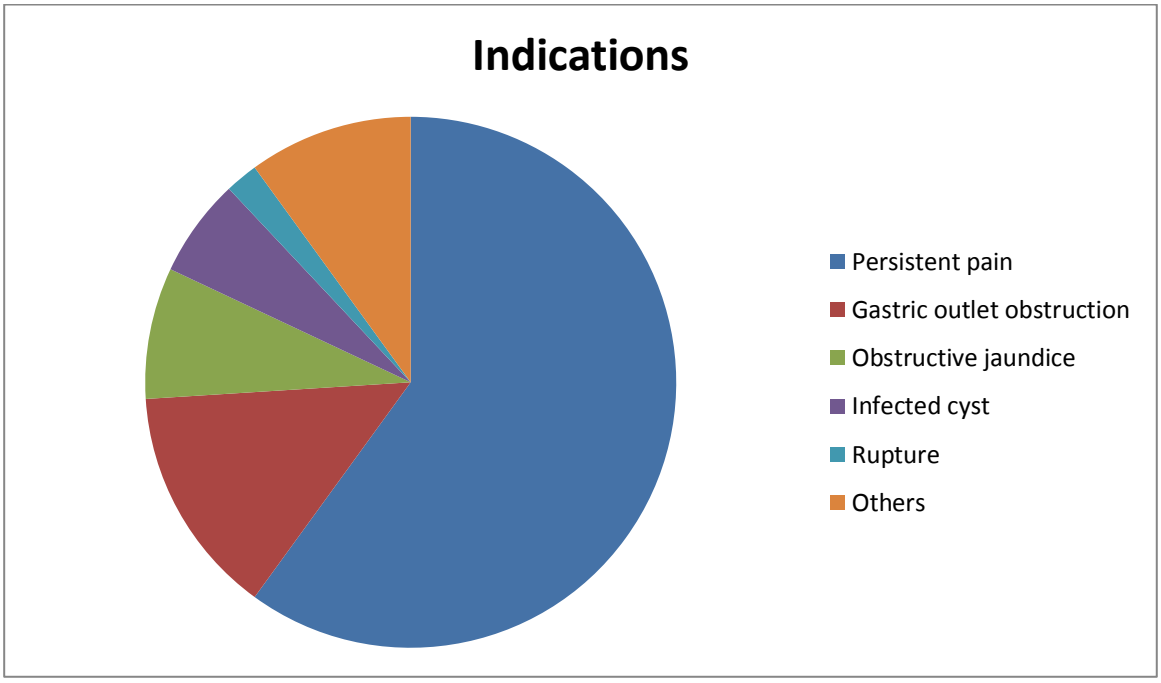


Table 3: Types of Intervention

Interventional Modality	No. Of cases	percentage
USG Guided Drainage	7	14%
Endoscopic	12	24%
-Transpapillary	9	18%
-Transgastric	3	6%
Surgery	31	62%
-Cystogastrostomy	18	36%
-Cystojejunostomy	13	26%
Total	50	100%

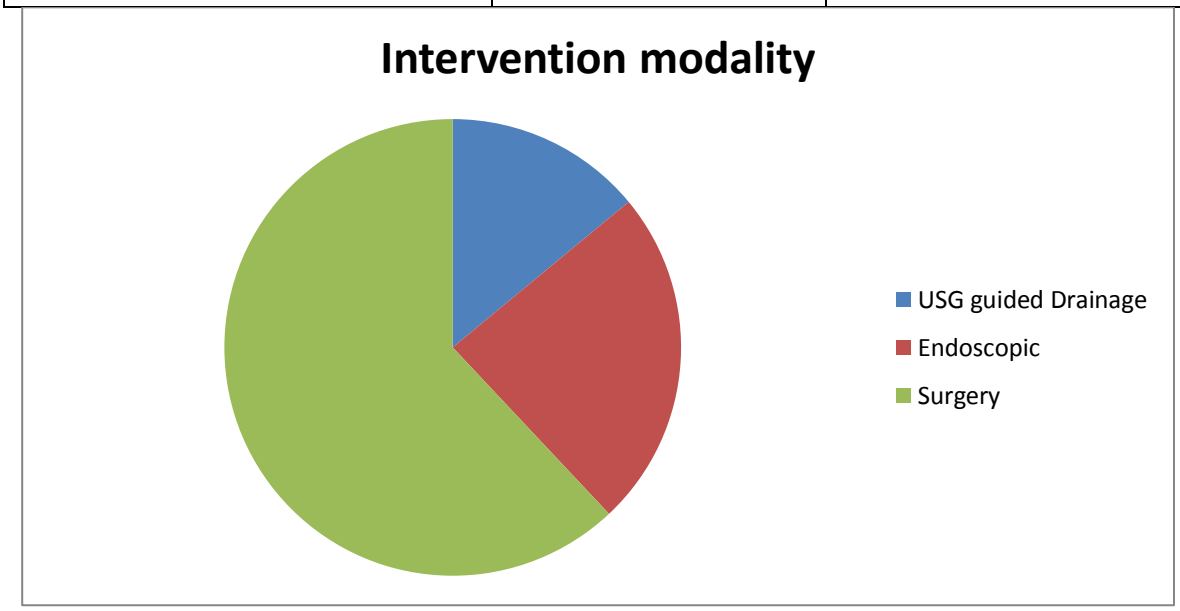


Table 4: Complications in USG Guided Drainage:

Complications	No.
Recurrence	2
Pancreatic fistula	1
Bowel perforation	0
Bleeding	0
Pleural effusion	1
Total	4 out of total 7 pts

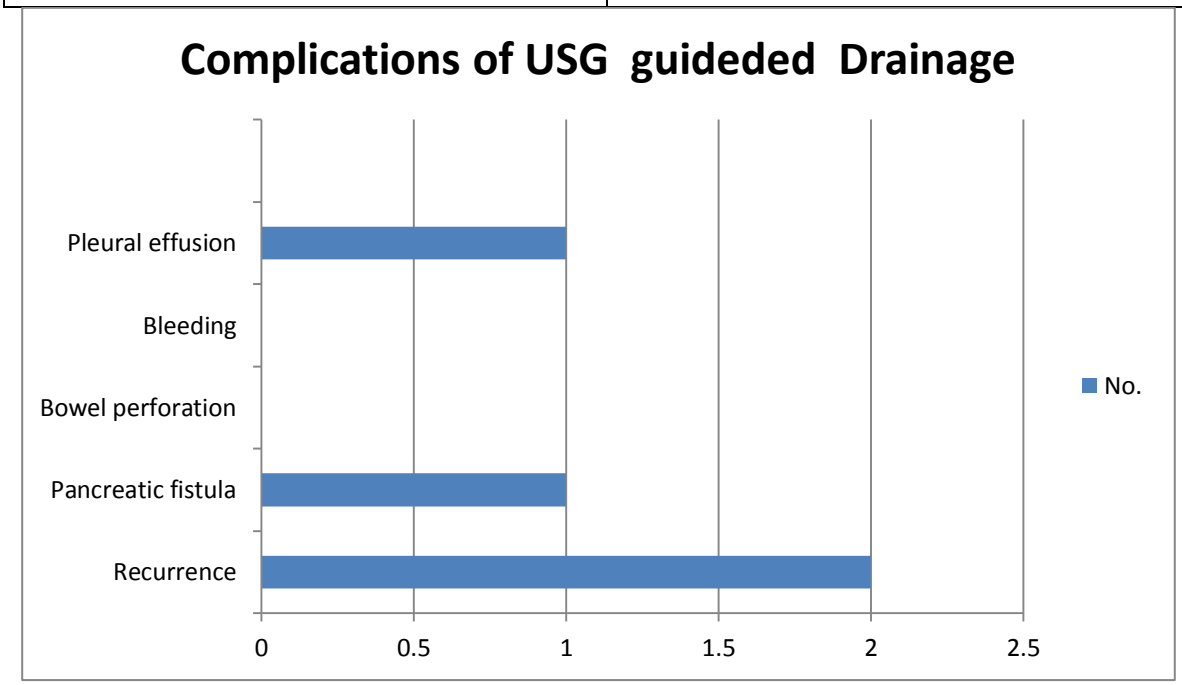


Table 5 : Complications in Endoscopic Guided Drainage:

complications	No.
recurrence	2
Pancreatic fistula	0
Bowel perforation	0
bleeding	1
cholangitis	1
total	4 out of total 12 pts

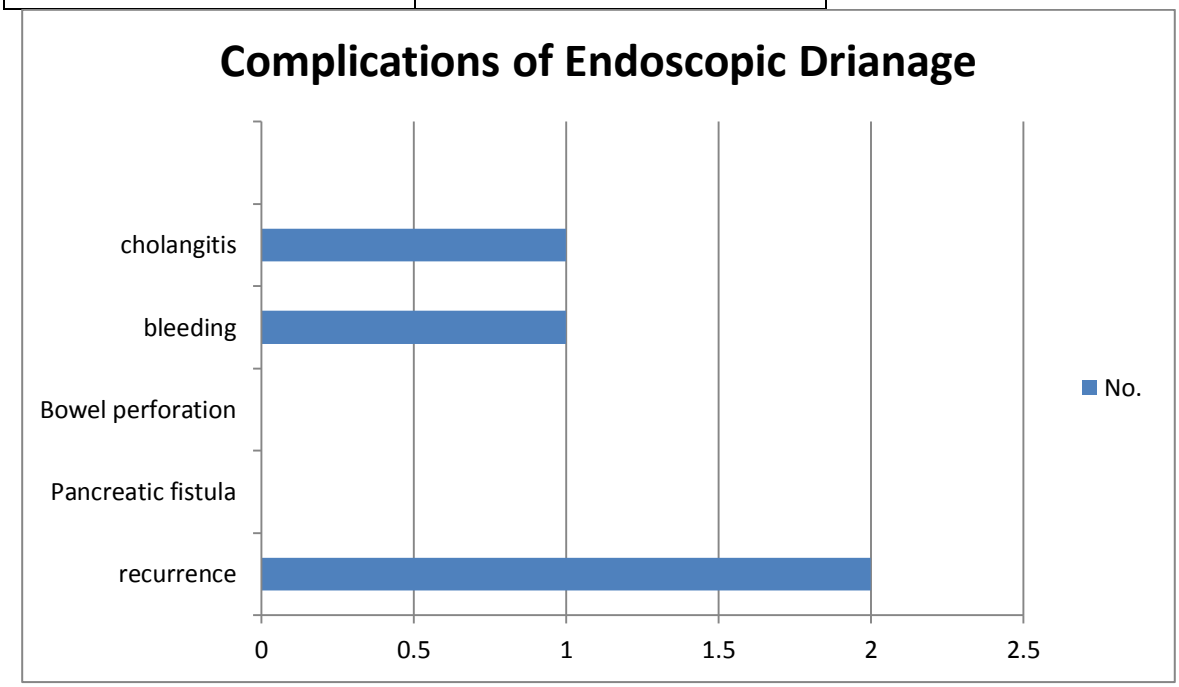


Table 6: Complications in Surgery - Cystogastrostomy:

complications	No.
recurrence	1
Pancreatitis	1
bleeding	2
Pleural effusion	1
total	5 out of total 18 pts

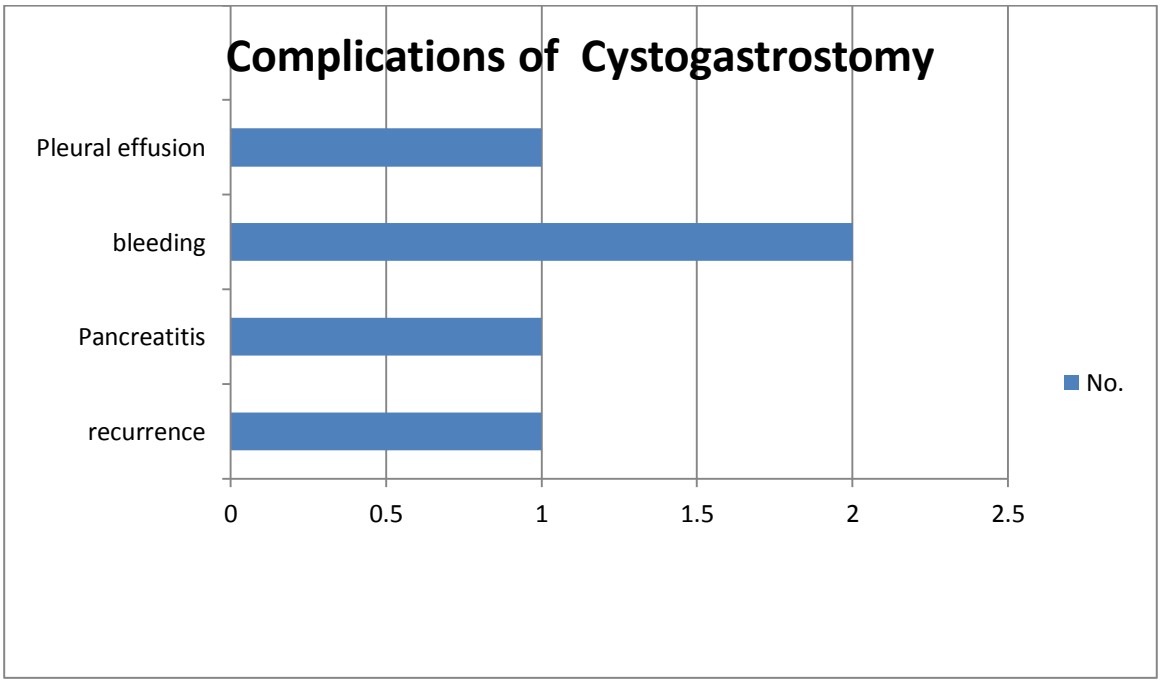


Table 7: Complications in Surgery - Cystojejunostomy:

Complications	No.
Recurrence	1
Pancreatitis	1
Bleeding	1
Pleural effusion	1
Total	4 out of total 13

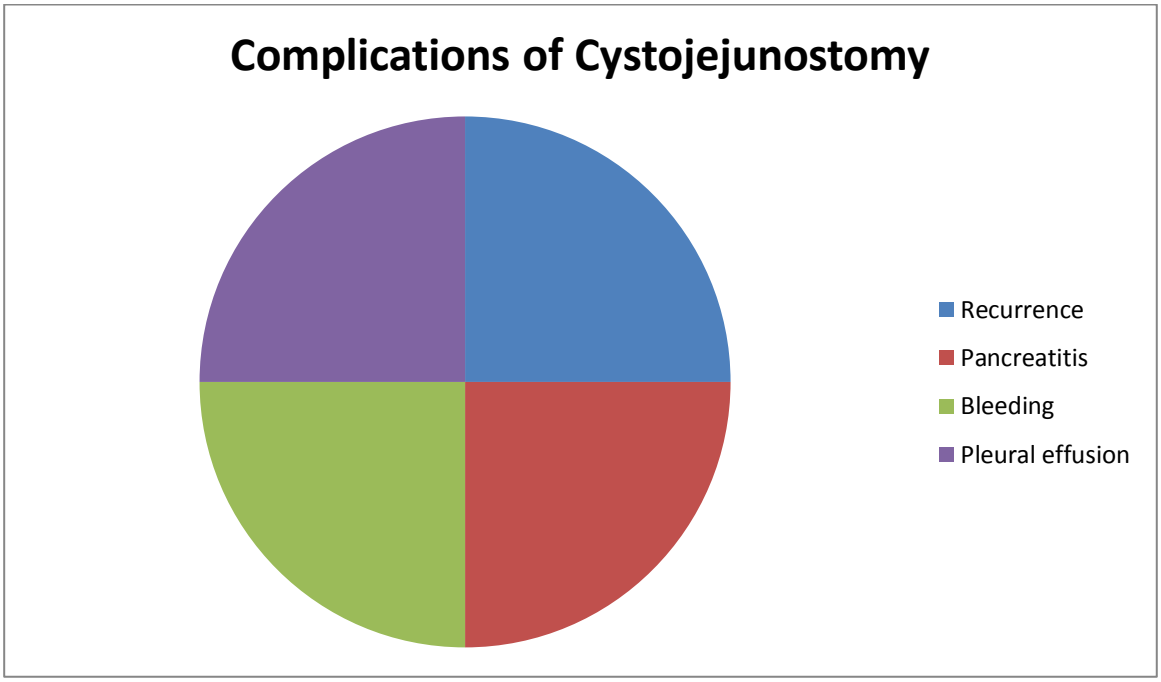


Table 8: Comparison of USG VS Surgical Intervention:

Treatment Modality	No. Of complications	No. Of Patients	percentage
USG Guided Drainage	4	7	57.1
Surgical Intervention	9	31	29

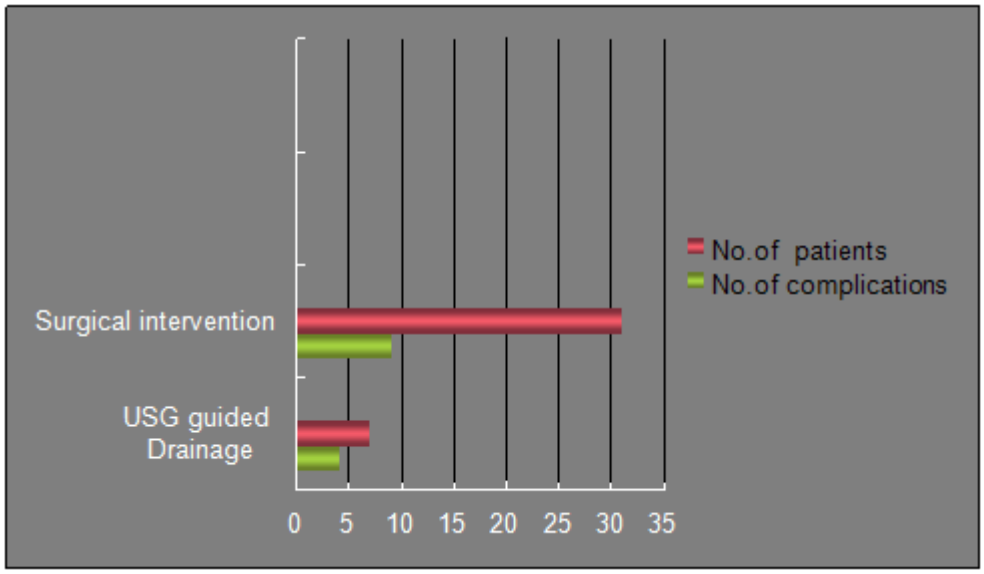


Table 9: Comparison of Endoscopic Vs Surgical intervention

Treatment Modality	No. Of complications	No. Of Patients	percentage
Endoscopic Drainage	4	12	33.3
Surgical Intervention	9	31	29

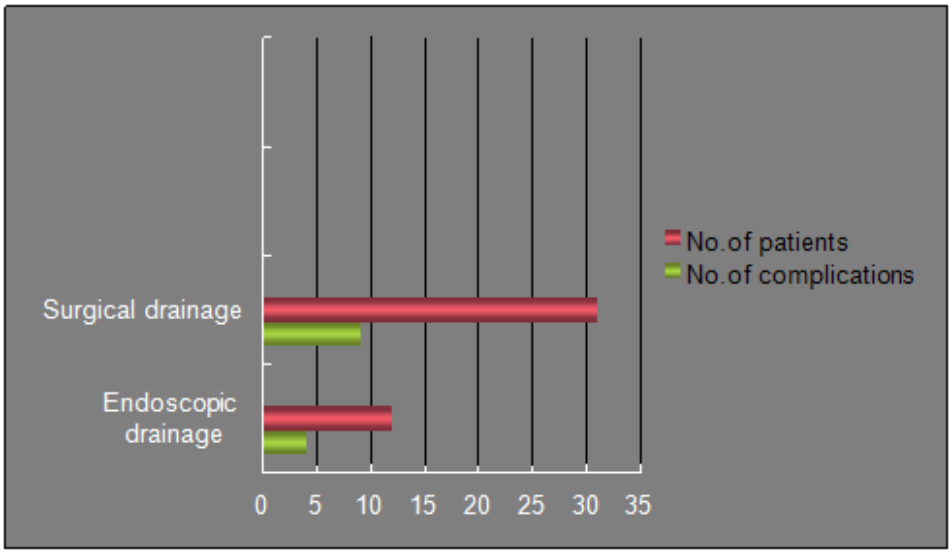
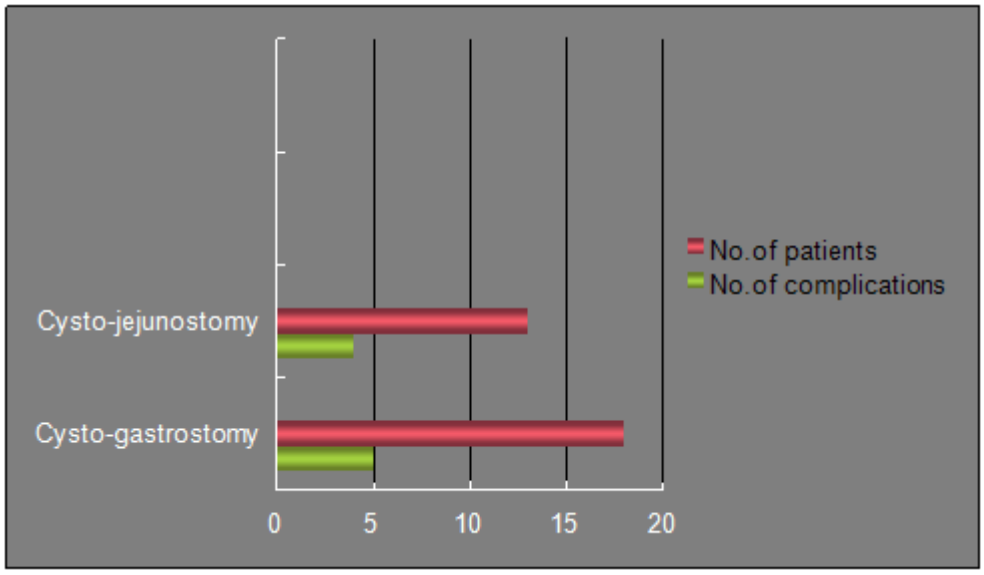


Table 10: Comparison of Cysto-gastrostomy VS Cysto-jejunostomy

Treatment Modality	No. Of complications	No. Of Patients	percentage
Cysto-gastrostomy	5	18	27.8
Cysto-jejunostomy	4	13	30.8



RESULTS

A total of 50 patients were included in the study. All the patients were available till the end of the study and for follow up.

Out of 50 patients the cause of pancreatic pseudocyst was found to be alcohol consumption in 80% & biliary causes in 14%.

The most common indication for intervention was persistent pain (60%) and Gastric outlet obstruction (14%).

The type of intervention was chosen based on the physical state of the patient as well as location and type of the pseudocyst.

USG Guided drainage was done in 14%, Endoscopic drainage - Transpapillary 18% & Transgastric 6% and Surgical drainage procedure - cystogastrostomy- 36% & cystojejunostomy 26%.

The complication rates in different procedures were as follows-

USG guided drainage - 4 out of 7 patients(57.1%)

Endoscopic drainage - 4 out of 12 patients(33.3%)

Surgical drainage - 9 out 31 patients(29%)

Among surgical modalities the complication rates of cystogastrostomy was 27.8% against cystojejunostomy - 30.8%.

The most common complication was recurrence of the pseudocyst that was found in 6 out of 50 patients - 12%.

Bleeding , fistula formation, sepsis , pancreatitis, bowel injury were among the other complications.

Elective surgery was done after a mean time gap of 45 days after diagnosing the pseudocyst.

One patient who had a recurrence after USG guided aspiration was again intervened with surgical approach.

Post operatively repeat imaging showed incomplete resolution or recurrence of the pseudocyst in 12% patients.

DISSCUSSION

Morbidity rates of surgical management of pseudocyst range from 29%- 57.1%. It depends on the physical status of the patient, the mode of intervention used for that particular patient and the need for more than one modality of treatment

Patients who failed with non-operative interventions should have a period of stabilization prior to definitive surgery. It is important to reverse sepsis and to improve nutritional status prior to intervention

It is technically challenging to operate on patients who failed nonoperative measures. The priority is to completely abolish the

prior cystic structure once it has been decompressed and the walls have fused.

Recommendations for Management

- Without evidence of complications, simple observation for a minimum of 6 wks
- Infected pseudocysts should be managed with percutaneous drainage until the patient is stabilized with proper resuscitation and antibiotics.
- Severe nutritional deficits, at times an indication for percutaneous drainage, should be addressed

Once the pseudocyst is established as persistent, observe truly asymptomatic patients with small cysts

- Intervention in all pseudocysts of size> 6 cm & symptomatic patients

- Use knowledge of the ductal anatomy to guide choice of interventional modality
    - Types V, VI, and VII pancreatic ductal injuries are all to be managed surgically
    - Types I and II are always managed conservatively or nonsurgically
    - Pancreatic ductal injury Types III and IV could be managed either way.
- Significant complications are most likely to occur if non surgical measures are to be used in patients who are most likely to sustain complications.

CONCLUSIONS

Surgical and endoscopic interventions for pancreatic pseudocysts are equally effective and safe with a less important role for percutaneous drainage.

Eventhough various minimally invasive procedures have come up for the treatment of pseudocysts, till date surgery remains the gold standard. Endoscopic drainage has nearly the same success and complication rates as against surgery. So endoscopic therapy should be considered for appropriate patients. Moreover even if the endoscopic intervention fails there is always the second choice of a surgical option left open.

At the same time USG guided percutaneous intervention has to be reserved for very sick and morbid patients as an emergency life saving procedure only, it is not to be used as a definitive procedure.

Among surgical methods both cystogastrostomy and cystojejunostomy are equally effective if individualized according to the patient factors.

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Annexure I

MASTER CHART

S.N0	NAME	AGE	SEX	IP.NO	LOCATION	SIZE	OTHER SPECIFICATIONS	INTERVENTION	COMPLI CATONS	FOLLOW UP
1	VENKATESAN	41	M	71725	BODY	6*7 CM		C.G		RES
2	VIJAYAKUMAR	28	M	67903	TAIL	8*6CM		C.J	B	RES
3	VENDA	37	F	72472	BODY	7*6CM		C.G		RES
4	GOUSH BASHA	34	M	79067	BODY	6*7CM		C.G		RES
5	VIJAYAKUMAR	34	M	67703	BODY	6*8CM		TRANSPAPILLARY DRAINAGE		RES
6	SHANKAR	42	M	79024	BODY	6*7 CM		C.G		RES

7	KAVERI	37	F	82503	TAIL	6*7.5 CM		C.J	P	RES
8	JAYAKUMAR	70	M	79367	BODY	7*6C M	ARF	USG GUIDED DRAINAGE	PE	RES
9	MUNUSAMY	35	M	78727	BODY	7*7C MM		T.G ENDOSCOPIC DRAINAGE		RES
10	KUMAR	37	M	78456	BODY	LARGEST 7*8C	MULTIPLE	C.G		RES
11	MANIKANDAN	30	M	79516	BODY	6*7C M		C.G	PE	RES
12	KUPPAN	45	M	80453	TAIL	7*6C M		C.J		RES
13	KUMAR	37	M	80876	BODY	7*7C M		C.G		RES
14	SURESH	27	M	79675	HEAD	7*6C M	PROXIMITY TO P.D	T.P	C	RES
15	UMAPATHY	35	M	80342	BODY	7*6C M	COMMUNICATING WITH P.D	T.P		RES
16	VADIVU	55	F	79841	BODY	8*7C M	SEPSIS	USG GUIDED DRAINAGE	F	RES
17	THOPLAN	75	M	82825	BODY	7*7C M	INFECTED	USG GUIDED DRAINAGE		RES
18	NATARAJAN	55	M	82462	TAIL	6*7C M		C.J		RES
19	SEKAR	35	M	82224	BODY	7*7C M		C.G		RES

20	MUTHURAJ	50	M	82343	BODY	LARGEST7*7 CM	MULTIPLE	C.G		RES
21	MUNIYAN	35	M	83010	TAIL	7*6 CM		C.J		RES
22	SELVI	27	F	84972	BODY	7*6 CM	PROXIMITY TO P.D	T.P		RES
23	GANAPATHI	25	M	82131	HEAD	7*7CM	COMMMUNICATING WITH THE PD	T.P	R	N.RES
24	SELVARAJ	45	M	83161	BODY	10*7CM		C.G		RES
25	MARIMUTHU	40	M	84012	TAIL	9*6CM		C.J	PE	RES
26	ARUL	30	M	84230	BODY	10*8CM		T.G	B	RES
27	KALIDAS	28	M	86213	BODY	9*6CM	COMMUNICATING WITH P.D	T.P		RES
28	ANBAZHAGHAN	60	M	87215	BODY	10*6CM	INFECTED	U.S.G GUIDED DRAINAGE	R	N.RES
29	RAJENDRAN	50	M	89310	TAIL	11*8 CM		C.J		RES
30	SUNDAR	43	M	90133	BODY	10*8CM		C.G	B	RES
31	RAVI	30	M	90833	TAIL	10*7CM		C.J		RES
32	KALYANI	60	F	91332	BODY	9*6CM	ARF	U.S.G GUIDED DRAINAGE	R	N.RES

33	SUBBHAMMA	50	F	92000	TAIL	15*6 CM		C.J		RES
34	MAHENDRAN	27	M	92312	BODY	10*6 CM	COMMUNICATING WITH P.D	T.P	R	N.RES
35	SHANTHI	55	F	93012	BODY	15*8CM	INFECTED	U.S.G GUIDED DRAINAGE		RES
36	KUMAR	40	M	93120	TAIL	10*8 CM		C.J		RES
37	MANOHAR	36	M	93222	HEAD	8*6CM	COMMUNICATING WITH THE P.D	T.P		RES
38	ELUMALAI	30	M	93067	BODY	8*6 CM		C.G		RES
39	LAKSHMANANSWAMY	40	M	93106	TAIL	15*10 CM		C.J	R	N.RES
40	ANBU	40	M	93086	BODY	LARGEST MEASURING 9*8 CM	MULTIPLE	C.G	R	N.RES
41	SUNDARRAJ	32	M	94321	TAIL	10*8 CM		C.J		RES
42	THANGARAJ	50	M	93400	BODY	10*9 CM		C.G	B	RES
43	KALIANNAN	60	M	93026	BODY	15*8 CM	INFECTED	U.S.G GUIDED DRAINAGE		RES
44	KRISHNAN	31	M	93122	BODY	9*6 CM	PROXIMTY TO P.D	T.P		RES

45	NARESH	28	M	93202	BODY	8*6 CM		T.G		RES
46	VENGANNA	40	M	93426	TAIL	10*6 CM		C.J		RES
47	CHINNAH	60	M	93521	BODY	16*12 CM		C,G	P	RES
48	UMESH	31	M	93622	BODY	7*8 CM		C.G		RES
49	NATARAJ	38	M	93722	BODY	9*6 CM		C.G		RES
50	SRINIVASAN	40	M	94026	BODY	8*7 CM		C.G		RES

KEYS TO THE MASTER CHART:

R-Recurrence, F-Pancreatic Fistula, PE-Pleural Effusion, B-Bleeding, C-Cholangitis, P-Pancreatitis.

C.J-- Cysto-Jejunostomy, C.G.- Cysto-gastrostomy

T.P- Transpapillary Endoscopic Drainage

T.G- Transgastric Endoscopic Drainage